EVALUATION OF LOCAL GOVERNMENTS CAPACITY IN THE MAINTENANCE OF POST-DISASTER ROAD RECONSTRUCTION ASSETS

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DECLARATION

This thesis is submitted under the University of Salford requirements for the award of a PhD degree by research. Throughout the period of the PhD study, some of the contents and findings have been published in refereed conference papers prior to the submission of the thesis (refer to Appendix A)

The researcher, therefore, declares that no portion of the work referred to in this thesis has been submitted in support of an application for another degree of qualification to the University of Salford or any other institution.

Ezri Hayat

DEDICATION

This piece of research is dedicated to my dearest late mother, my father, my parents in law, my precious wife Nanda, and my lovely boys Jielan and Keenan.

ABBREVIATIONS AND GLOSSARIES

Abbreviations

ADB	*Asian Development Bank*
APBA	*Anggaran Pendapatan dan Belanja Aceh - The annual budget and expenditure of Aceh province*
APBD	*Anggaran Pendapatan Dan Belanja Daerah - The Annual Budget and Expenditure of the Provincial and Local Government*
APBK	*Anggaran Pendapatan dan Belanja Kabupaten/ Kota - The Annual Budget and Expenditure of Local Governments in Aceh*
APBN	*Anggaran Pendapatan dan Belanja Negara - The National Annual Budget and Expenditure*
ASNLF	*Acheh-Sumatra National Liberation Front; international name for Aceh Free Movement - GAM*
Bappenas	*Badan Perencanaan Pembangunan Nasional – Ministry of National Development Planning*
BNPB	*Badan Nasional Penanggulangan Bencana – National Disaster Management Agency*
BPN	*Badan Pertanahan Nasional – National Land Agency*
BPS	*Badan Pusat Statistik – Statistics Indonesia*
BRR	*Badan Rehabilitasi dan Rekonstruksi Aceh Nias – the Rehabilitation and Reconstruction Agency for Aceh – Nias*
BSi	*British Standard Institute*
DAK	*Dana Alokasi Khusus (Specific Grant Allocation)*
DAU	*Dana Alokasi Umum (Block Grant Allocation)*
DFID	*Department for International Development*
DoT	*Department of Transportation*
DPW	*Department of Public Works*
EM-DAT	*Emergency Event Database*
GAM	*Gerakan Aceh Merdeka – Aceh Free Movement*
GoI	*Government of Indonesia*
GRDP	*Gross Regional Domestic Product*
HMA	*Hot Mix Asphalt*
IFRC	*International Federation of Red Cross and Red Crescent Societies*
ILO	*International Labour Organisation*
IREP	*Infrastructure Reconstruction Enabling Program*
IRFF	*Infrastructure Reconstruction Financing Facility*
JICA	*Japan International Cooperation Agency*

MDF	*Multi Donor Fund*
MNSC	*Malaysian National Security Council*
MoF	*Ministry of Finance*
MoHA	*Ministry of Home Affair*
MPW	*Ministry of Public Works*
OTSUS	*Otonomi Khusus – Special Autonomy*
PERPU	*Peraturan Pemerintah Pengganti Undang – Government Regulation in Lieu of Law*
PFM	*Public Financial Management*
UNDP	*United Nations Development Programme*
WB	*The World Bank*

Glossaries

Bupati	*Regent - head of district government)*
Dana Tambahan Migas	*Additional revenue sharing of oil and gas*
Kecamatan	*Sub district*
Kelurahan	*sub-district government*
NVivo	*Qualitative data analysis software*
Otsus fund	*Special Autonomy fund*
Pagu	*Budget ceiling*
Pemerintah Daerah	*Regional governments; refers to both the provincial and local governments*
Peraturan Pemerintah	*Government Regulation*
Qanun	*Regional regulation in Aceh province*
Tanah Adat	*Customary Law Land Title*
Ulama	*Moslem clerics*
Undang	*Laws*

ABSTRACT

Road infrastructures play an important role in the economic improvement of the community in the surrounding area. The better speed, flexibility, and accessibility to reach virtually all points are the distinct features that road infrastructure offers compared with other transport systems. In major disasters, road transportation infrastructure is one of the largest sectors which frequently suffer the most damage and losses. Road transport disruptions are also suggested as the critical constraints to providing effective and efficient responses in an emergency, and that the limited access results in high transport costs and procurement lead times. Accordingly, the reconstruction of the road infrastructure is among the highest post-disaster reconstruction priorities and is expected to help accelerate the overall disaster-recovery process.

To achieve the maximum benefit of the investment made in the reconstruction, the road infrastructure requires adequate maintenance. Road maintenance offers significant benefits to the road users through the provision of better access, comfort, and lower vehicle operating costs. Road maintenance neglect may therefore result in increased vehicle costs, accelerated deterioration due to the heavier and more frequent traffic, and severe damages requiring early reconstruction of road.

In the case of the 2004 Boxing Day tsunami in Aceh, Indonesia, the pledges made to Aceh exceeded the required amount to restore the affected areas to their original conditions. Accordingly, more than 3600 km of roads were reconstructed whilst initially around 2700 km of roads were destroyed by the disaster. Most of the local roads were reconstructed either by the national government or a donor agency, which were transferred back to the local governments for the operational and maintenance needs. As nearly 80% of the road networks in Indonesia are district roads, the overall quality and sustainability of the road infrastructure are significantly dependent on the capacity of the local governments in road maintenance. Accordingly, this study aimed to evaluate the capacity of the local governments in the maintenance of the road infrastructure assets within the context of the post-disaster reconstruction process.

In order to achieve the aim and objectives of the research, this study implemented a pure qualitative method. Multiple case study was selected as the research strategy. Three districts

were included as the case studies, the district of Aceh Besar, Aceh Jaya and Aceh Barat Daya. Semi-structured interviews with high-level officials, policy makers, and the stakeholders of post-disaster road infrastructure reconstruction at the national, provincial, and the local level were conducted as the primary data collection methods. The data was analysed using the content analysis technique, with the aid of NVivo version 10 software. The findings of the research were validated by the means of the literature review and expert interviews.

The findings suggest that the road infrastructure was generally neglected from maintenance. The local governments of the case studies lacked the preventive maintenance culture, and their general responses to preserve the road infrastructure were to postpone the maintenance need by using the more expensive high standard pavement types (HMA) and to repair the roads when they have broken. This condition was affected by a number of internal and external factors. The local political condition, the socio-economic condition, the conflict of authorities between government agencies involved in road maintenance, and the poor financial capacity of the districts, were exacerbated by the poor capacity of the road authorities' personnel. A framework for the reconstruction and maintenance of road infrastructure assets was also suggested indicating the different phases of road infrastructure life cycle in a post-disaster context.

Chapter - 1 INTRODUCTION

1.1 Background of the study

In the last several decades, the world has seen an increase in the number of natural disasters. Not only has the trend shown an increased in the number of disaster events, the number of the affected people and the financial damages and losses are also increasing. The Emergency Event Database – EM-DAT, reveals that in the last three decades, nearly 300 natural disaster events occur each year with an average of more than US$ 70 billion worth of damages annually.

According to the United Nations Development Programme (UNDP, 2004), natural disaster events are scattered across the world and strike 75% of the world's area at least once in the last three decades. In addition to the increasing number of natural disaster events, the geographical distribution of the natural disaster has also been unequal, leaving some regions being more vulnerable to disaster than the others. In the last three decades, EM-DAT records of the natural (EM-DAT, 2013) for the period of 30 years between 1984 and 2013 shows that Asia experiences the largest number of disasters, particularly in the southern, south-eastern, and the eastern part of the continent. The three regions had experienced nearly 3400 disaster events with a total of more than US$ 1,084 billion worth of damage, killing more than 1.1 million people. Furthermore, the statistical data suggest that the three most destructive natural disasters - storms, earthquakes and flood, frequently occur in the developing countries. The Inter-American Development Bank IaDB (2010) highlights that while 75% of the world population are concentrated in the developing countries, they suffer 99% of the mortality caused by the natural disasters.

Furthermore, whilst storm and floods have been recorded as the most frequent disasters, earthquakes are the most costly type of disaster. On average, each earthquake disaster causes more than US$ 918 million worth of damage (EM-DAT, 2013). In the developing world, one of the biggest disasters caused by the earthquake and tsunami ever recorded in terms of damage and the number of affected people is the Boxing Day tsunami in Indonesia on December 26th 2004. In Indonesia, the earthquake and the tsunami caused the road infrastructure sector to suffer the most damage and losses after the housing sector (Bappenas, 2005).

Transport disruption into and out of the disaster affected area is a vital constraint to the provision of an efficient response in an emergency situation (Grünewald et al., 2010). Therefore, not only will providing access to the isolated areas reduce the cost and time for delivering the emergency aid, it will also help accelerate the overall disaster recovery process. As a result, the reconstruction of the road infrastructure becomes one of the top post-disaster reconstruction priorities.

Additionally, post-disaster reconstruction is commonly implemented using the Build Back Better principle. Accordingly, providing that the fund is sufficient, the reconstruction of the road infrastructure is expected to recover the affected areas beyond their original condition in terms of quality and quantity. However, even though such an extended scope of reconstruction is aimed at reducing the number of isolated areas and improving the economic condition of the affected areas, it may lead to giving extra and long-term maintenance burdens to the recipient governments, particularly the local governments with poor maintenance capacities.

1.2 Justification for research

Not only disasters cause a significant setback to the development of an area, disasters also provide opportunities. On the one hand, disasters cause significant setbacks in the development of a country due to the destruction of investments made in the social and economic sectors, as well as due to the redirection of funds for the reconstruction which could have been used for development (UNDP, 2004). On the other hand, disaster also offers opportunities for the physical, social, political and environmental development that may not have been available previously (Asgary et al., 2008). Such development opportunities may occur in the form of raised awareness towards disaster risk reduction, upgraded health facilities, safer building codes, as well as improved quality and wider road infrastructure networks.

By improving the road infrastructure beyond its original condition, it is expected that the reconstruction will reduce the number of isolated areas in the affected regions. The two main features that road infrastructure offers, access and mobility, are in turn expected to help stimulate the improvement of the local economy. However, such efforts also raise a concern to the long-term maintenance of the road infrastructure. Improving road surface quality and

building wider road networks beyond its initial level present the local government and the respective road management agencies the extra and long term technical and financial burdens for the maintenance. Additional resources and knowledge may also be required to maintain and ensure that the newly reconstructed road assets would reach their design-life and are worth the investment value.

The life-cycle of the road infrastructure generally consists of procurement, operation and maintenance, as well as renewal or disposal of assets (British Standard Institute - BSi, 2008). Prior to that, feasibility studies will need to be performed to justify and support the needs of the project. However, the dynamic condition and the pressure to accelerate the recovery process, a complete feasibility study may not be appropriate in a post-disaster reconstruction. Also, local governments may not be actively involved in the pre-procurement (planning and design) and the procurement phase (tender and construction) of the road infrastructure reconstruction in a post-disaster context, as these particular tasks appear to be performed either by the national government or the donor agencies. The reconstructed assets will later be transferred back to the local governments for the operational, maintenance, and renewal (reconstruction) needs, disregarding their capacity and ability to maintain the assets.

Various studies have been conducted on the road infrastructure subject, focusing on the different aspects as described in the following. Perera et.al, (2009) argue that road construction projects requires better handling strategies due to its exposure to various risks. Chang (2000) evaluates the losses and impacts of the Kobe earthquake in Japan and the recovery of the port, while Anapolsky (2002) and Waters (1999) identify challenges associated with the road construction projects in Montenegro and Poland. A number of studies also reveal that cost escalation has been considered a major and a commonly found issue in a road reconstruction project. The major causes of cost escalation and their significance to road project delays have also been identified (Odeck, 2004, Kaliba et al., 2009). Furthermore, Wichan et al. (2009) and Hegazy and Ayed (1998) develop a Neural Network model to forecast the final highway project budget and duration, while Paul et al. (2009) try to eliminate delays through the development of a rapid construction decision making system in order to accelerate the road construction preliminary process. Additionally, studies on the impact of a road construction project to the

community have also been performed towards women's home industry in Nigeria (Porter, 1995) and the post-harvest crop losses in Malawi (Cheesman, 1993).

Even though there is a vast range of literature available on the road construction and the road maintenance issues, literature that links the road construction and the post-disaster context is very limited, particularly those which are focused on the long-term maintenance capacity of the local governments. Therefore, concluding the above discussion, since the local governments are held responsible for the management of the road infrastructure, it is argued that the local governments' roles and their long-term maintenance capacity should be accounted for in a post-disaster road reconstruction plan. This is particularly important when the capacity of the local governments has been renowned to be reasonably poor and the amount of pledges made for the reconstruction of the region exceeds the actual needs; providing enough fund and greater opportunity for implementing the *'Build Back Better'* principle and extending the scope of reconstruction to the widest extent possible. Accordingly, a strategy to properly plan and adequately incorporate the local government capacity into the post-disaster road reconstruction plan is considered to be the key to ensuring the sustainability and maximizing the investment value in the post-disaster infrastructure reconstruction.

The study is focused on the reconstruction of the tsunami in Aceh, Indonesia. This is particularly due to the overwhelming impacts of the disaster, as well as the extensive reconstruction activities which took place during the post-tsunami reconstruction period. Subekti (2009) highlights that more than 900 national organisations from 55 countries were involved in the reconstruction of the tsunami in Aceh. Additionally, as much as US$ 7.2 billion of pledges were made for the Aceh reconstruction. These conditions, consequently, raise the concerns which form the basis of the study; the challenges and obstacles of the post-disaster reconstruction of road infrastructure, the role of the local government in the road reconstruction process, and the capacity of the local governments to maintain the road reconstruction assets.

1.3 Aim and objectives

The aim of the study is to evaluate the capacity of the local governments in the maintenance of the road infrastructure assets within the context of the post-disaster reconstruction process. The following objectives are formulated to achieve the aim.

- To explore the road infrastructure reconstruction process, policy, and management model in Indonesia at the national and the local government level
- To identify and analyse the obstacles and challenges of road reconstruction in a post-disaster context.
- To analyse the local government's roles in the road infrastructure reconstruction and their capacity in the maintenance of road infrastructure assets.
- To develop a framework for post-disaster reconstruction of road infrastructure.

1.4 Research Methodology

Complementing the process of justifying and deriving the research problem, the discussion of the research methodology adopted in this study will be presented broadly in chapter 3. This research adopts the interpretivism view in terms of its philosophical assumptions, which is delivered in the subjectivism and value laden nature. The nature of the research aims, objectives, and the research questions lead to the selection of the multiple-case holistic case studies as the most appropriate research strategy. The research evaluates and analyses the capacity of the local government in the maintenance of the post-disaster road reconstruction assets and makes linkages to the post-disaster road reconstruction process.

As the research does not try to observe changes and the development of a phenomenon or phenomena over a period of time, from the time horizon perspective, it is accordingly considered as a cross-sectional study. Additionally, the research collected the secondary data from documents and archival records, including reports, journals, and standards related to the focus of the study. The primary data was collected using semi-structured interviews with the representatives of the government bodies at the national, provincial and local levels, donor agencies, as well as consultants and contractors representing the private sectors. The findings were validated through semi-structured interviews with the experts in the research area. For the analysis of semi-structured interview data, content analysis and cognitive mapping methods were used with the aid of the computer-aided software NVivo (version 10).

1.5 Contribution to knowledge

A typical post-disaster road reconstruction project has a number of challenges and obstacles (Hayat and Amaratunga, 2011). Much of the literature currently available focuses on the challenges and issues in the road reconstruction in a normal development context. Moreover, very little literature was identified incorporating the capacity of the local governments to maintain the reconstructed asset as one of the post-disaster road reconstruction requirements. It was realised that there is a gap in the knowledge concerning the reconstruction of the road infrastructure in the post-disaster context, particularly those which link the road reconstruction with the local government maintenance capacity. In fact, the local governments will eventually be held responsible for these assets once they are completed. Accordingly, this research fills this gap and makes a contribution to the road reconstruction in a post-disaster context. Additionally, the result of this study is expected to help improve the road reconstruction process which maximises the value of investments made in the post-disaster reconstruction.

1.6 Structure of the thesis

The structure of the thesis chapters is organised in the following order:

1.6.1 Chapter 1 – Introduction

This chapter provides an overview of the thesis by presenting a discussion on the key issues which lead to the justification of the research and the development of the aim and the objectives of the study. It also presents a brief introduction of the research methodology adopted for this study, including the study's expected contribution to theory and practice.

1.6.2 Chapter 2 – Literature Review

This chapter provides a discussion and the key issues identified from the literature review process, leading to the identification of the research problems of the study. Accordingly, the chapter presents a review of the literature related to disaster and disaster management, reconstruction of road infrastructure in a post-disaster context, and the road infrastructure management issues. Additionally, this chapter also includes literature on the decentralisation and conflict issues to provide a context to the Indonesia and Aceh condition, which form the basis of this research.

1.6.3 Chapter 3 – Research Methodology

The research methodological design and the research process adopted in the study are broadly elaborated in this chapter. The discussion will be initiated with the establishment of the research problem, followed by detailed argumentation on the research philosophy, research approach, research strategy, research choice, and the time horizons, as well as the data collection and analysis technique adopted in this study. The procedure of the data collection and analysis is also presented in the subsequent section, followed by the PhD thesis writing procedure and process.

1.6.4 Chapter 4 – Conceptual Framework

This chapter presents the conceptual framework of the study. The conceptual framework chapter discusses the key issues of the study, the relationship between the key issues as well as the research boundary which explains the extent of the study.

1.6.5 Chapter 5 – Data Analysis

This chapter presents the analysis of data collected in the study. The data analysis is presented based on the major categories emerging from the content analysis method. This chapter is divided into four sections. Section A presents the analysis of the high-level semi-structured interviews. Section B discusses the analysis of the case studies. Section C provides a cross-case discussion and will compare and contrast the result of analysis from the case studies. Section D presents the discussions resulting from the expert semi-structured interviews, validating the main findings of the research.

1.6.6 Chapter 6 – Research Findings

Chapter 6 elaborates an overview of the research findings. When appropriate, the research findings will be compared and contrasted with the literature, as a means of triangulation and validation of the research findings.

1.6.7 Chapter 7 – Conclusion

As the final chapter of the thesis, this chapter describes the conclusion of the study, based on the empirical investigation. The research findings will be supported by the contribution of the

study to the theory and practice. The chapter also describes the limitation of the study as well as the suggested future research areas.

1.7 Summary and the link

As the introductory chapter of the thesis, this chapter is intended to provide an overview of the research. The chapter presents the background of the study as well as the justification of the research, which forms the basis of conducting the study. Prior to discussing the summary of the research methodology adopted in the study, the research aim and objectives have been specified. Finally, the expected contribution to knowledge is also described, followed by the outline of the report structure. The following chapter accordingly discusses the process of literature review for this study.

Chapter - 2 LITERATURE REVIEW

2.1 Introduction

Previous chapter provided the background of the study as well as the process of research problem identification, which leads to the formulation of the aim and objectives. It also summarises the research methodology and the contribution to knowledge that the research is aimed to provide.

This chapter presents the comprehensive literature review and syntheses which have been carried out in the identification of the research needs, aim and objectives (summarised in section 1.3 of chapter 1 and is further detailed in section 3.2 of chapter 3). As the study merges two major areas, disaster management and road infrastructure management, this literature review chapter is accordingly structured to provide a better flow of discussion as presented in the following:

- Section 2.1 introduces the purpose of the study and summarises the structure of discussions presented in this chapter.
- Section 2.2 explores and provides an overview with regards to disaster and disaster management.
- Section 2.3 discusses the reconstruction of road infrastructure in a post-disaster context.
- Section 2.4 elaborates the theories on the road maintenance.
- Section 2.5 elaborates the discussion of the disaster and road infrastructure maintenance in the Indonesian context.

Having provided the structure of this section, the following section will commence with exploring the general overview of the disaster and disaster management issues.

2.2 Disasters and disaster management

2.2.1 Definition of a disaster

There have been a large number of studies and literature focused on the disasters and disaster management subject, covering almost every aspect of the development sectors. These studies

include social learning (O'Brien et al., 2010), housing (Gauchat and Schodek, 1980, Boen, 2006, Johnson, 2007, Gayani and Raufdeen, 2010), land management (Fitzpatrick, 2006, Oxfam, 2006), knowledge management (Eriksson, 2009, Kaklauskas et al., 2009), women empowerment (Ginige et al., 2009), road and transportation (Scanlon, 2003, Perlez, 2006) and Waste Management (Karunasena et al., 2009).

However, disregard to the number of studies on the subject of disasters and disaster management, there seems to be no universal definition of disaster used by the scholars or institutions. The differences in the definition of disaster appear to be affected by the geographical, economic, and the political situation of the respective countries (Eshghi and Larson, 2008), making it practically impossible to summarise in brief (Alexander, 2005). Some of the disaster definitions include "an event or series of events that threaten and disrupt the lives and livelihoods of the society caused either by natural factors and/ or non-natural factors and human factors that result in human casualties, damages to the environment, loss of property, and psychological impact" (Law, 2007), and as “an emergency situation of some complexities that will cause the loss of lives, damage to property and the environment, and hamper the local social and economic activities" (MNSC 2003, cited in Shaluf and Ahmadun, 2006). Furthermore, DesInventar (2012) defines disaster as “the set of adverse effects caused by social-natural and natural phenomena on human life, properties, infrastructure and environment (an 'event') within a specific geographic unit during a given period of time."

In addition to the aforementioned definitions, the most relevant and frequently referred to definitions within the disaster management context is probably the one defined by EM-DAT and the United Nations International Strategy for Disaster Reduction – UNISDR. EM-DAT defines a disaster as “a situation or event which overwhelms local capacity, necessitating a request at a national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering” (Vos et al., 2010). UNISDR (2009) defines a disaster as “a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources."

Even though the definition of disaster varies slightly among the scholars and institutions, the emphases are generally addressed to three aspects; the adverse impact of the event, the scale of disruption and distress in the community, and the capacity of the affected community to cope with the resulting impacts on their own resource. These three factors are used as indicators of whether or not an event is considered a disaster. Additionally, EM-DAT stipulates that it will only record an event in their disaster database if one of the following criteria is met; 10 or more fatalities, 100 or more people are affected, declaration of a state of emergency and call for international assistance (Guha-Sapir et al., 2011). As the definition of disaster has been elaborated in this section, the next section will accordingly discuss the disaster management aspect.

2.2.2 Disaster management

Likewise disaster, disaster management has also been defined differently. It is therefore argued that understanding the aim of conducting disaster management may help define what disaster management is. According to Warfield (2004), the aim of disaster management is “to reduce or avoid the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery." The International Federation of Red Cross and Red Crescent Societies - IFRC (2012) assumes disaster management to be “the organisation and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters.” Furthermore, Kaklauskas et al., (2009) argue that post-disaster management strategy should be compatible with the disaster level, economic, social, cultural, institutional, technological, environmental and legal/ regulatory condition of the respective areas. They also argues that no single strategy could be applied to all countries and what is considered the best strategy of one country cannot simply be copied to another country. To accommodate the differences in disaster management definitions, Emanuele et al., (2009) describe disaster management as “the body of policy and administrative decisions, the operational activities, the actors and technologies that pertain to the various stages of a disaster at all levels.”

From the various descriptions and definitions of disaster management, it can be concluded that disaster management is related to the management of policy making, the required response

activities, and the stakeholders which depend on the type of the disaster and their positions in regard to the disaster management cycle. Even though the disaster management strategy may be unique to certain areas and for certain conditions, there are, however, major components of disaster management that are relatively similar regardless of the type of disaster and its location. The major components of disaster management will be presented in the following section.

2.2.2.1 Components of disaster management

In the discussion of the components of disaster management, scholars and organisations (eq. Wolensky and Wolensky, 1990, Freeman et al., 2003, DFID, 2005) use different approaches. As discussed in the next paragraphs, the components of disaster management are generally described based on the activities included in the process with respect to the phases of the disaster management cycle, or based on the core elements requiring management.

With regard to the activities in disaster management, the components can be classified into two major phases of the disaster management cycle; pre-disaster and post-disaster. According to Freeman et al. (2003), the pre-disaster components include risk identification, risk mitigation, risk transfer and preparedness. It is in this phase where disaster risk management and disaster risk reduction activities generally take place, which measures include policy and planning, physical preventive, physical coping and/or adaptive measures, and community capacity building (Department for International Development - DFID, 2005). Furthermore, the post-disaster components include emergency response, rehabilitation and reconstruction. Other scholars also refer to the rehabilitation and reconstruction phase as the early-recovery period and the long-term recovery period (Wolensky and Wolensky, 1990). Since the activities in disaster management are closely related to the disaster management cycle, more detailed discussion of this issue will be addressed in section 2.2.2.2 regarding disaster management cycle.

On the other hand, disaster management may be described based on the core elements of a disaster requiring management. Khan et al. (2008) argue that a disaster is the result of the combination of hazard, vulnerability and insufficient capacity or measures of the affected people to reduce the potential chance of risks. They argue that disasters only occur when

hazards and vulnerabilities meet, and also bring in the third element - capacity, into the discussion about disaster management. Capacity is imperative, as it may affect the severity of hazard impacts and people's ability to cope with disaster. Therefore, these three elements are seen as the basic components of disaster management.

In accordance with the definition of disaster described previously in section 2.2.1, even though hazardous events may occur relatively anywhere in the world, the capacity and the vulnerability level of the local community may differ. Consequently, what is considered a disaster in one area may not be deemed a disaster in another area, i.e. should it happen in an area with less vulnerable people or communities, or when the affected communities are able to cope with the impact with their own resources and capacities. Accordingly, it is therefore imperative to understand the respective three components of disaster; hazards, vulnerability, and capacity, which may affect decisions and responses made towards disaster events. Accordingly, more discussion on the three components of disaster management is presented in the following sections.

2.2.2.1.1 Hazard

A hazard can be defined as "a dangerous condition or event, that threatens or has the potential for causing injury to life or damage to property or the environment" (Khan et al., 2008). Generally, hazards can be divided into three categories. Firstly, hazards are called natural hazards if they are caused exclusively by natural origins (earthquake, cyclone, volcanic eruption, etc.). Secondly, socio-natural hazards are hazards which are caused by both natural and man-made causes (flood, landslide, fire, etc.). Thirdly, man-made hazards are those caused by human negligence (pollution, dam failure, wars, etc.).

Additionally, Etkin and Dore (2003, cited in Ashlin and Ladle, 2007) argue that natural hazards will turn into a disaster when they reveal the social vulnerability and cause damage to both the physical and social fabric of an environment. Similarly, Cannon (2008) highlights that even though a disaster which is related to the natural hazards is generally understood and recognised as a natural disaster, a disaster is largely the product decisions made by the human being involving the economic, political and social factors.

2.2.2.1.2 Vulnerabilities

Vulnerability is generally understood as “the extent to which a community, structures, services, or geographic area is likely to be damaged or disrupted by the impact of particular hazards, on account of their nature, construction and proximity to hazardous terrain or a disaster-prone area” (Khan et al., 2008). In addition, Rottach (2010) denotes that vulnerability depends on the social, economic, cultural and political conditions, which are the result of the internal changes and outside influences.

In general, vulnerability can be divided into two categories, physical and socioeconomic. The physical vulnerability is rooted in the physical characteristic of the people or buildings. This includes proximity, location, structural strengths, etc. The socioeconomic vulnerability, on the other hand, is rooted in the socioeconomic condition of the people or the community at risk. Included here are the levels of poverty, education, gender, age, etc. For instance, poor people may be more vulnerable to earthquakes due to their inability to build sound concrete houses. On the other hand, people living in poorly built concrete houses may be more vulnerable to earthquakes than the people living in timber houses. However, even though the vulnerability paradigm is often associated with poverty and marginalisation, Cannon (2008) warns that regarding vulnerability as more or less the same as poverty may lead to ignoring or undermining other hazard risk characteristics that may be different from poverty.

2.2.2.1.3 Capacity

In addition to hazards and vulnerabilities, capacity is argued to be one of the important elements of disaster management. Khan et al., (2008) define capacity as “resources, means and strengths, which exist in households and communities and which enable them to cope with, withstand, prepare for, prevent, mitigate or quickly recover from a disaster." Furthermore, Khan et al., (2008) classify people’s capacity into physical and socioeconomic capacity. Physical capacity is the ability and skills that the affected people possess, which enable them to survive or cope with the impact of the disaster. Similarly, socioeconomic capacity is the economic and social condition of the affected people, which help them to survive or to cope with the disaster impacts. For instance, a wealthy community with strong social cohesion is more likely to survive and quickly recover from disaster impact than the poor community.

In line with the definition of the disaster, it is the capacity of vulnerable people to cope with the hazardous events that distinguishes and makes a hazardous event an emergency situation or a disaster. It is therefore argued that capacity building or capacity development should be integrated with any disaster mitigation or disaster reconstruction effort.

The basic components of disaster management have been discussed in sections 2.2.2.1.1, 2.2.2.1.2, and 2.2.2.1.3 above with regards to hazards, vulnerability and the capacity of the affected community. As part of the discussion on the disaster management topic, it is also necessary to understand the different activities involved in the disaster management, which are mainly segmented and embedded into different phases, which form the disaster management cycle. More detail discussion on this issue will be presented in the following section.

2.2.2.2 Disaster management cycle

Warfield (2004) suggests that disaster management cycle is “an ongoing process by which governments, businesses, and civil-society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred... (including) the shaping of public policies and plans that either modify the causes of disasters or mitigate their elects on people, property, and infrastructure." Furthermore, disaster management activities can be divided into several groups based on the timing and foci on the particular activities. These activities altogether form a recurring and continuing pattern that illustrates the on-going process which can be regarded as the disaster management cycle.

Scholars and institutions define the disaster management cycle differently. Some scholars separate disaster management activities into three phases of emergencies or crises; pre-emergency/ crisis, emergency/ crisis and post-emergency/ crisis, (Messer, 2003, Emanuele et al., 2009). Wolensky and Wolensky (1990) divide the post-emergency phase as the early-recovery and long-term recovery period. Similarly, Messer (2003) further subdivides disaster management activities into several groups, namely prevention, mitigation and preparedness (pre-emergency phase), response (emergency phase) and recovery and development (post-emergency phase).

Nevertheless, the slightly different definitions and naming of disaster management activities are generally in accordance with the so-called *conventional* disaster management cycle, which particularly consists of mitigation, preparation, response, and recovery as illustrated in the following figure.

Figure 2.1 – Disaster Management Cycle

Source: Shukla (2013)

The many variables and activities involved in the application and implementation of disaster management lead to the requirement of the tailoring and understanding of the area and the context into which the disaster management strategy is to be implemented. Accordingly, as mentioned earlier in section 2.2.2, Kaklauskas et al. (2009) argue that no single strategy could be applied to all countries and what is considered the best strategy of one country cannot simply be copied to another country.

With regard to development and disaster risk management, UNDP (2004) distinguishes two types of disaster risk management; compensatory disaster risk management and prospective disaster risk management. Whilst compensatory disaster risk management is focused on the "amelioration of existing vulnerabilities and reduction of natural hazards that has accumulated through past development pathways," prospective disaster risk management suggests that "development programmes and projects need to be reviewed for their potential and to reduce or alleviate vulnerability and hazards." Referring to the disaster management cycle, the compensatory disaster risk management is more focused on the preparedness and response

phase and stands alongside development planning. Prospective disaster risks management, on the other hand, is part of the sustainable development planning and is argued to be particularly effective in the post-disaster reconstruction phase, when disasters provide the greatest opportunity for development.

The above discussions on the issues of disaster management components and the activities in each phase of the disaster management cycle indicate the links between disaster and development. Accordingly, the next sections will provide a discussion on the link between disaster and development, which cover the issues of development opportunity in disaster and followed by the sustainability aspect development.

2.2.3 Disaster and Development

Previously in section 2.2.2 the components of disaster management and the various activities in each phase of the disaster management cycle have been discussed. Accordingly, this section will provide a discussion about the link between disaster and development. UNDP (2004) considers natural disaster as both a cause and product of failed development. It argues that, on the one hand, natural disaster causes a significant setback to development through destruction of infrastructure, the erosion of livelihoods, damages to the integrity of ecosystems and architectural heritage, injury, illness, and death. On the other hand, however, risks of disaster have also accumulated through inappropriate development interventions. Concentration of people in hazard prone areas, collapsed building, and environmental degradation are few examples of how failed development has contributed to, at least, magnifying the extent of damages and losses in a disaster event. Nevertheless, disaster event is also argued to provide a window of opportunities for development, as will be discussed in more detail in the following section.

2.2.3.1 Development opportunity in disaster

On the one hand, disasters may cause great suffering to the people and cause significant setbacks to the development of a country through destruction of decades of social and economic investment as well as redirection of funds, which could have been used for the development (UNDP, 2004). On the other hand, however, disasters also offer opportunities for physical, social, political, and environmental development that may have not been available

previously (Asgary et al., 2008). These development opportunities may appear in the form of higher media and political attention as well as the communities' raised awareness regarding disaster issues, improved and better enforced building codes, upgraded health facilities, as well as construction of new and improved road infrastructure resulting from the post-disaster reconstruction activities. Moreover, the increased political and media attention should also be used as an opportunity for promoting and implementing the build back better principle and to maximise the improvements that can be achieved following a disaster occurrence. Since such momentum will not last for a long period after a disaster, Asgary et al., (2008) argue that stakeholders' collaboration and participation, knowledge and experience, long-term and holistic vision, division of labour, and use of resources need to be used optimally as post-disaster opportunities within the first two years after the disaster occurrence.

Corresponding to the link between disaster and development, even though disaster may open up a window of opportunities for development due to the raised awareness and attention towards the importance of disaster management, such opportunity is also affected by the availability of the fund for the reconstruction, as it may affect the extent to which post-disaster reconstruction can reach. Nevertheless, it is also argued that in addition to funding availability, it is equally important that any of the improvements and opportunities resulted from the post-disaster response can be sustained, in order to maximise the investment made in the reconstruction period, as well as to avoid the recurrence of the disaster in the future. Accordingly, the issue of post-disaster reconstruction fund availability will be discussed in the following section 2.2.3.2, which will be followed by the discussion on the sustainability and sustainable development in section 2.2.3.3.

2.2.3.2 Post-disaster reconstruction fund

As previously mentioned in section 2.2.3.1 above, the extent to which a disaster may be used as a development opportunity also depends on the availability of funds for the reconstruction. The availability of funds for post-disaster reconstruction can be divided into three different scenarios. Each of these three different scenarios also has different targeted outcomes (Pranoto, 2011). The first scenario is when funds are inadequate for restoring the affected region to its pre-disaster condition. In this case, priorities are given to the reconstruction of housing and the rehabilitation of public service at the minimum level, and the provision of aid

to stimulate the economic recovery. In the second scenario, the fund is just adequate to restore the affected region to its pre-disaster condition. The rehabilitation and reconstruction is expected to exceed the minimum level of public service standard and to cover all of the affected sectors and areas. The third scenario is when the availability of funds exceeds the amount required to restore the affected region to its original condition. In this situation, the rehabilitation and reconstruction activities are expected to cover the wider areas and beyond the affected sectors and areas.

2.2.3.3 Bounce-back, bounce-forward, and disaster resiliency in post-disaster reconstruction

Having discussed the opportunity in disasters and the link to development, there comes a need to understand the notion of "bounce-back", "bounce-forward" and their relevance to the disaster resilience concept. The terms "bounce-back" or "bouncing-back" have been used widely to describe the ability to recover from impacts and pressures resulting from an accident, trauma or in this case, a disaster event. The notion has therefore appeared in the area of business (Margolis and Stoltz, 2010), biology (Hamzelou, 2012), neurobiology (Requarth and Crist, 2011), material science (2014) as well as in disaster management (Manyena et al., 2011), to illustrate the ability and capacity of the affected objects to revert to their original condition, hence resilient.

From the disaster management perspective, Manyena et al. (2011) suggest that the notion of "bounce-back" liberates resilience from the vulnerability conundrum. This has mainly helped distinguish the concept of vulnerability and resilience. As Irfanullah (2014) suggests, the "bouncing-back" capacity of a group of people refers to the ability to return back to the original state, prior to the disaster. However, Manyena et al. (2011) further argue that the use of the "bounce-back" notion in describing disaster resilience may overlooked the changes that accompanied disaster events in that the affected areas may never be the same as the pre-disaster condition. Additionally, such a view also emits the massage which may be contradictory to the spirit of moving forward and making improvements in the post-disaster recovery activities – the "build back better" principle. Accordingly, there comes the other notion of "bouncing-forward". Manyena (2009) argues that the idea of resilience should be seen as the ability to "bounce-forward" or "move-on" following a disaster, as it has psychological and more optimistic implications to adopt positive behaviour in assisting disaster victims. Similarly,

McKinney (2014) proposes that the goal of resiliency is not necessarily to bounce back, but to bounce-forward. By acknowledging the need to consider both notions, he suggests the importance to adapt whilst maintaining the main purpose by redesigning organisations, institutions, and systems to better absorb disruptions. Nevertheless, the extent to which post-disaster reconstruction activities can be implemented also depends on the availability of fund for the reconstruction, as discussed previously in section 2.2.3.2.

Having described the notion of bounce-back and bounce-forward, and their relevance to the disaster resilience concept, the following section will accordingly discuss the concept of sustainability and sustainable development as embedded concepts in the post-disaster reconstruction.

2.2.3.4 Sustainability and sustainable development

Historically, disaster management has focused upon the provision of responses and humanitarian assistance where the allocation of resources could have been provided for vulnerability reduction and development efforts (Alexander et al., 2006). However, as the occurrence of disasters has increased over the last several decades and the losses and damages have significantly multiplied (Rodriguez et al., 2009, Vos et al., 2010, Guha-Sapir et al., 2011), disaster management practitioners are more aware of the disaster cycle and that the continuing exposure of vulnerable people to hazards and the resulting consequences are in many cases avoidable. This is where the link between development and disaster management eventually becomes visible and why, to be more specific, the aspect of sustainable development should be embedded into the disaster management strategy.

The word sustainable, as a derivation of 'sustain', is defined in the Oxford English Dictionary as, ‘being able to be maintained at a certain rate or level’. However, in the context of development and disaster management, the practical definition of *sustainability* has developed and become a more complex word which can be seen from the various facets of development, including environmental, social and financial. From the disaster management perspective, Gilmour et al. (2011) argue that since the disaster management paradigm has shifted towards disaster risk reduction, the difficulty in defining sustainable development is rooted in its very broad nature and politicised purpose. Additionally, *Forum for the Future* (2005, cited in Gilmour et al., 2011)

defines sustainable as having the 'capacity for continuance' and refers to sustainability as a 'quality', and therefore observes that sustainable development is the process by which sustainability is achieved. Environmental sustainability, for instance, has been set as one of the eight Millennium Development Goals, which is targeted on reversing the loss of environmental resources, reducing biodiversity losses, improving basic sanitation and safe drinking water and reducing the number of slum dwellers (United Nations, 2012). From the infrastructure management point of view, the definition of sustainability goes beyond environmental protection in that it needs to include "equity matters and the practicality of financing the policies in question over the long term" (Bayliss, 2002).

The term sustainable development was popularised in 1987 when it was discussed in the "Report of the World Commission on Environment and Development: Our Common Future" (United Nations, 1987). The report is also widely known as the *Bruntland Report*, named after the Chair of the commission and the former Prime Minister of Norway, Gro Harlem Bruntland. In the report, sustainable development is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their needs." Even though the report provides a general and broad definition of sustainability, and its practical use in specific fields will need further adjustment and fine-tuning, it has raised the awareness of the importance of incorporating the principle of sustainable development into the development activities, including the post-disaster reconstruction.

Due to its broad nature, defining sustainable development is rather difficult and highly dependent on the practical use of the definition and may therefore differ between agriculture, social, health, construction or economics. *Forum for the Future* (2005, cited in Gilmour et al., 2011), emphasises the fact that sustainable development is "a dynamic process which enables all people to realise their potential and improve their quality of life in ways, which simultaneously protect and enhance the earth's life-support systems." Accordingly, specifically addressed for the purposes of infrastructure management, Gilmour et al. (2011) suggest that sustainable development should be seen as "a vision that integrates immediate and longer-term needs, local and global needs, and regards society, environment, and economics as inseparable and interdependent."

Regardless of the debatable definition of sustainable development, a conclusive argument is further proposed by Gilmour et al. (2011), by stating that any development can be described as sustainable only if it integrates the economic, social, and environmental issues. They further developed three sets of benchmark indicators for a sustainable infrastructure development project for each of the three aspects. Among others, the benchmark indicators include demographic, employment rates, investment stimulation, regeneration and job creation (economic aspect); waste, air, water, noise, energy and transport use level (environmental aspect); housing provision, community satisfaction, social inclusion, participation and responsibility as well as stakeholder acceptability (social aspect). Supporting their argument, Lewis (1999, cited in Alexander, 2004) links the issue of sustainable development with post disaster reconstruction planning by stating that post-disaster reconstruction planning needs to be holistic, which goes beyond replacing the damaged buildings and infrastructure but also considers the reconstruction of the communities, ensuring equity, access to resources, and the equality of opportunity for the most disadvantaged communities, as well as reducing community vulnerability.

In addition to the above arguments, Kaklauskas et al., (2009) support the idea that post-disaster management strategy should be compatible with the disaster level, economic, social, cultural, institutional, technological, environmental and legal/ regulatory conditions of the respective areas. It is probably due to these reasons that the role of local governments in disaster management is argued to be increasingly important for the disaster management efforts to succeed. Accordingly, the following section will provide a discussion on the issue of local government and disaster management.

2.2.4 Local government and disaster management

2.2.4.1 Roles of the local government in disaster management

As previously mentioned, the importance of the role of the local governments in disaster management has been increasingly recognized by disaster management practitioners. ISDR highlights four major roles of local governments in disaster management, which include coordination of multi-level and multi-layer stakeholders, community engagement and linkage

with government priorities, strengthening of the institutional capacity, and implementation of innovative DRR tools and techniques (ISDR, 2010).

Additionally, Berke et al. (1993) emphasise the importance of maximizing external aid during disaster recovery to establish more effective self-directed and sustainable development initiatives within the local organisations. They also highlight the needs for the locals to assume the role of active participants, rather than the helpless victims. In a similar fashion, ISDR (2010) argues that local governments have crucial roles in the disaster-recovery process as it will sustain development once the external stakeholders leave. The collaboration between the provincial, local governments and other stakeholders is considered very important as it may result in an effective coordination of overlapping resources and responsibilities as well as in pooling expertise required for the recovery.

In addition, Wolensky and Wolensky (1990) summarise that much of the focus of disaster management has been placed on the local governments due to at least four reasons; (i) disaster management is implemented by the local government, (ii) there is a growing recognition that the local governments play the most active roles in emergency operations, (ii) disaster-related expectation at the federal level is shifting towards the subnational government, and (iv) many of the states require localities to develop comprehensive emergency plans.

Moreover, local government is considered to be in the best position to effectively engage local communities. Kusumasari et al., (2010) underlines that local governments play important roles before, during and after the disaster because they know the community very well. Haddow and Bullock (2006, cited in Col, 2007) add that “the key government level (in case of the emergency) is the one that has relevant equipment and adequate management capacity while still being close to the ground and in the midst of the emergency incident." Accordingly, the key government level referred to in their statement is the local government as the body that is closest to the emergency site and the affected community, which is also required to provide the most immediate response should an emergency event takes place.

2.2.4.2 Local government capacity in disaster management

Despite the growing recognition and needs of the roles of local governments in disaster management, the local governments’ capacity in disaster management has been arguably

inadequate. With regard to disaster management practices, de Guzman (2003) argues that the disaster management practices in most countries, particularly in the developing world, are more inclined towards managing the responses to disasters (which requires preparedness) rather than managing risks and the underlying conditions that lead to disasters (which among other actions requires risk assessment, vulnerability reduction and capacity enhancement). On the other hand, Kusumasari et al., (2010) assert that studies of the role of local government in disaster management have been under-explored in at least two major aspects. First, most studies have been addressed at the local governments in the developed countries with only a few focused on the local government in the developing countries. Second, the resource capabilities of local government in managing disasters at every stage of the disaster cycle are rarely examined.

Whilst examining a programme is essential, and evaluation is necessary for future improvement, the evaluation of emergency plans has proven to be difficult. As highlighted by Henstra (2010), the infrequent occurrence of emergencies makes it difficult to evaluate the emergency management programmes and to measure the performance in this field. This condition also results in the implementation of lessons learned obtained from one disaster being hard to replicate in another disaster. It is even more difficult to replicate the success story of the local government's role in disaster management in a developed country to the local governments in developing countries. As a consequence, this condition is suggested as one of the reasons why the capacity of local government remains a major problem in the disaster management initiative.

ISDR (2010) denotes five key points of challenges and opportunities to consider when attempting replication. The first is the lack of interest and capacities of the local government. Here, the support of partner agencies such as national government, donors and NGOs is expected to play a catalytic role to fill the initial gaps. The second is understanding local risk and vulnerabilities. Even though it has been suggested that local governments know their community very well, they often lack sufficient knowledge about disaster risks and vulnerabilities of their communities as well as the required and appropriate measures to mitigate disaster. The third key point is with regard to the maintenance and upgrading of critical infrastructure. Whilst the local governments are responsible for a number of critical

infrastructures, the investment to make them resilient is often not very visible, resulting in neglect and dilapidation. Fourth, managing a long-term process is difficult. Being a long-term process, disaster risk reduction initiatives often suffer from staff changes and unequal interest among the key decision makers. Fifth, learning from disasters. It is argued that people are more tempted towards short-term, visible recovery works. However, the momentum created by a disaster is often to be a very effective time to initiate changes and to engage local governments and communities with the long-term efforts.

Nevertheless, the capacity of the local governments is poor and often leads to local government being unable to cope with the problem of overload and is replaced by an improvised emergency government or by the higher level of authorities (Barton, 1970 cited in Wolensky and Wolensky, 1990). Therefore, it is argued that unless the cause of such a problem is understood at the local level, the effort to fully embed disaster management into the local government action will be difficult to realise. The following section will accordingly identify the common causes of the local governments' inadequate disaster management capacity.

2.2.4.3 Common causes of the Local Governments inadequate disaster management capacity

Wolensky and Wolensky (1990) suggest that there is a pattern of inconsistent and often weak performance by the local governments across all disaster stages. Two impediments have been accused as being the major causes of this condition; the local unwillingness and the low capacity to meet new expectations. Cigler (1987, cited in Wolensky and Wolensky, 1990) referred to the problem as the "inter-governmental paradox of emergency management, whereby the governments least likely to perceive emergency management as a key priority –the local governments - are at centre stage in terms of responsibility for emergency management."

With regard to the organisational and inter-organisational issues, Turner (1976) concludes that common causal features that often occur in the public sector are "the rigidities in the institutional beliefs, distracting decoy phenomena, neglect of outside complaints, multiple information-handling difficulties, exacerbation of the hazards by strangers, failure to comply with regulations and a tendency to minimize the danger." All of these factors are frequently incubated and accumulate unnoticed until the onset of a disaster and the resulting cultural collapse.

In addition to the aforementioned factors, Wolensky and Wolensky (1990) also suggest that in dealing with major disasters, there is a problematic belief that the demands of major disaster can be met merely by extending routine procedures; which conforms with Drabek's finding that "everyday measures used for ordinary emergencies cannot be extrapolated for use in major disasters"(1986, p46 cited in Wolensky and Wolensky, 1990). The next section will provide further discussion on the critical success factor to improve the local governments' disaster management capacity.

2.2.4.4 Critical success factors to improve the Local Governments' disaster management capacity

Complementing the above discussion, Kusumasari et al. (2010) conclude that to improve the capacity of local government in disaster management, there are a number of critical success factors that need to be addressed. These success factors can be grouped into six categories, namely; institutional, human resources, policy for effective implementation, financial, technical and leadership. More detail on the critical success factors is presented in Table 2.1.

The key critical success factors of disaster management, as stipulated in Table 2.1, covers the various aspects of the local government and the disaster management issues. The institutional factors, for instance, affirm the importance of clear structure, role, responsibilities and relationships between all levels of government in order to avoid confusion that may occur in the dynamic and pressured environment of the emergency phase.

With respect to the reconstruction of road infrastructures, it is argued that the financial commitment should be given a significantly high priority due to the value of losses and damages in the sector, the importance of the facilities for the overall recovery, the value of the investment provided for the reconstruction as well as the long-term maintenance requirement to ensure the sustainability of the reconstructed assets.

Table 2.1 – Local Capability Requirements and Critical Success Factors of Disaster Management

Local government capability: Key functional success factors	
Institutional	Having a clear structure, role, responsibilities, and relationship between all levels of government
Human resources	Having sufficient personnel, proper task delegation, and division of labour
Policy for effective implementation	Availability of appropriate policies, rules, and regulations for making decisions, mobilising resources and engaging relevant public/private organisations
Financial	Having sufficient financial resources to support activities in all stages of disaster management
Technical	Having an effective logistics management system, sufficient information technology systems, and communication networks between organisations, communities, and media representatives
Leadership	Building local level leadership to make quick and appropriate decisions if and when needed

Source: Kusumasari et al. (2010)

The above sections have provided a discussion on the issue of disaster, disaster management, as well as the role of local government in the disaster management. The common causes of the local governments' inadequate capacity as well as the success factors have also been covered. Accordingly, the following section will elaborate the aspect of capacity building in the context of post-disaster reconstruction. It is argued that providing a discussion on the capacity building aspect will complement previous discussions and enrich the understanding on the capacity issues.

2.2.5 Capacity building in the post-disaster road reconstruction context

This section elaborates the concept of capacity and capacity building. The discussion will be initiated by presenting the concept of capacity, followed by the concept of capacity development and the challenges in delivering capacity building initiatives in the post-disaster reconstruction.

2.2.5.1 The concept of capacity

UNISDR (2009) defines capacity as “the combination of all the strengths, attributes and resources available within a community, society or organisation that can be used to achieve the agreed goals.” With regard to the characteristics of capacity, Morgan (2006) underlines that due to the different perspectives and the flexibility of the term capacity to cover a range of circumstances, capacity may be seen as a training, a general management problem-solving tool, or as an umbrella term to which most programming and initiatives can be re-packaged, re-labelled, and re-legitimised. It is therefore argued that in the discussion of capacity issues, the characteristics within which the concept of capacity is understood need to be highlighted. He accordingly defines capacity as "the ability of a group or system to make positive contributions to the public life.”

Morgan (2006) argues that a study which focuses on the capacity issues is immediately challenged by the various understandings of the term capacity. He asserts that this condition occurs due to a number of reasons, including the absence of generally accepted definition of capacity, the rapid expansion of the range of capacity issues, the different perspectives of capacity seen by different actors, as well as the little interest of organisations to devise a more sophisticated formulation of capacity. As a result, the understanding of capacity as defined from a macro perspective (e.g. the capacity of a country in increasing its GDP) generally differs from that of the micro perspective (e.g. the capacity of personnel to communicate with their colleagues).

Following the above discussion, Morgan (2006) accordingly summarises five characteristics of the concept of capacity: Capacity is about empowerment and identity; Capacity has to do with collective ability; Capacity as a state or condition is inherently a systems phenomenon, involving a complex combination of attitudes, resources, strategies, and skills of both the tangible and intangible; Capacity as a potential (latent) state which is elusive and transient; and Capacity is about creation of public value. In accordance with the different characteristics of capacity as mentioned above, the capacity may be defined differently according to the operational needs. For the operational purpose of this study, local government road maintenance capacity is therefore defined as “the ability of local government to effectively and efficiently manage resources, skills and organisational attributes in order to maximize the value of investments

made in the road reconstruction." As the main concept of capacity has been elaborated, the discussion progresses to the concept of capacity building in the next section.

2.2.5.2 The concept of capacity building

2.2.5.2.1 Capacity building and capacity development

As the definition of capacity varies, the definition of capacity building and capacity development predictably varies between organisations. The particular term of capacity development is a relatively new concept which emerged in the early 1990s. UNDP (2008b) distinguishes the difference between capacity building and capacity development mainly on the different connotations that each term carries. The term capacity building is generally considered to imply a process which starts at a zero point and to create something that did not previously exist. As cited in UNDP (2008b), the OECD/ DAC defines capacity building as a process "starting with a plain surface and involving the step-by-step erection of a new structure, based on a preconceived design." On the other hand, the term capacity development suggests that there are some existing capacities, which are used as the starting point for the improvement and enhancement process. Accordingly, UNDP (2008a) defines capacity development as "the process through which individuals, organisations and societies obtain, strengthen, and maintain the capabilities to set and achieve their own development objectives over time." Slightly differently, UNISDR (2009) defines capacity development as "the process by which people, organisations and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including through improvement of knowledge, skills, systems, and institutions." Additionally, Bolger's definition of capacity development refers to the approaches, strategies, and methodologies used by the developing country, and/ or external stakeholders, to improve the performance at the individual, organisational, network/ sector, or broader system level (Bolger, 2000). However, UNISDR (2009) denotes that the concept of capacity developments extends the term capacity building to cover all aspects of creating and sustaining the capacity over time. Furthermore, even though the concept of capacity development was introduced relatively recently, it is actually complementing the existing ideas such as institutional building, institutional development, human resources development, development management, and institutional strengthening (Ginige and Amaratunga, 2011).

Regardless the different definitions of the capacity building and capacity development, the researcher argues that the differences between the two terms do not sit in the definitions of the terms, but rather in the connotations that the words “building” and “development” imply. Accordingly, the researcher suggests that as long as the key elements of the process are well understood, there will be no significant impacts of using these two terms interchangeably. It is accordingly worth noting that the interchangeable use of the term capacity building and capacity development in the following section is solely for the purpose of keeping the original citations and not to indicate them as two separate ideas.

2.2.5.2.2 The key elements of the capacity building framework

Kenny (2007b) suggests that capacity building activities are aimed at ‘developing the skills, resources and knowledge of groups, organisation or nations.’ Hence, capacity building practically refers to approaches, strategies and methodologies used to improve the performance of individuals, community, organisations or countries to carry out particular functions (Kenny, 2007b), at the different social level (Bolger, 2000).

Moreover, with regard to the community capacity building, McGinty (2002) emphasises five key elements to be incorporated in the capacity building strategic plan. The five key elements are knowledge building, leadership, network building, valuing community, and the supporting information and analysis. Within the context of post-disaster Waste Management, Karunasena et al. (2010) propose seven principles of capacity building activities and processes, which include skills and confidence building, organisational implementation, linkages and collaboration, continuity and sustainability, investment in infrastructure, research and development, as well as communication and coordination. The capacity building appears to be implemented in three broad forms; community development, skilling and training, and involvement of external experts in the reconstruction and development of local political, social and economic infrastructure (Kenny, 2007b). However, she warns that the use of training as a form of capacity building tends to exclude the local participants as the trainer and does not normally start with the needs as identified by the local community.

Furthermore, the capacity development is widely described either as a process or an objective (Bolger, 2000). The capacity development frameworks have advanced in the recent years.

According to Bolger (2000), the needs of capacity development is initiated as a response to the shortcomings in development assistance, which is primarily due to dominant role of donor-led projects and inadequate attention to the long-term capacity. As a consequence, the sustainable impact of the development projects has been limited.

While the various frameworks differ in detail, they generally highlight the processes, capacity levels, and the different dimensions within which the capacity development program is taking place. Capacity building activities can be implemented using a top-down or bottom-up approach and may also be generated internally or externally (Kenny, 2007b). For instance, Ginige and Amaratunga (2011 pp. 21) develop a capacity development framework that highlight the various roles of the stakeholders involved in a capacity development process with regard to the four phases of capacity development; analysis, creation, utilisation, and retention. Moreover, Bolger (2000) proposes a capacity development framework which consists of the four interrelated dimensions of sustainable capacity building. The four dimensions are individual level, organisational level, sector/ network level, and the enabling environment (Figure 2.2).

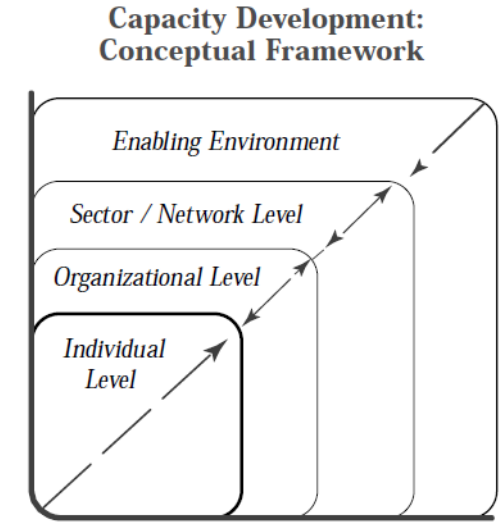


Figure 2.2 – Conceptual Framework for Capacity Development

Source: Bolger (2000)

The conceptual framework of capacity development as shown in Figure 2.2 illustrates the different actors and levels involved in the capacity development process. At the highest level,

'Enabling environment' represent the broad condition where the capacity development process is being implemented. At the sector/ network level, the coherent sector (and cross sector) policies, strategies, programming frameworks, and effective coordination are considered as the key aspects of the capacity development. The organisational level, on the other hand, focuses on the organisational structures, processes, resources and management issues. It is also argued that the performance of an organisation is affected by the availability, effective use and motivations of individuals as the final and the lowest element of the capacity development framework (Bolger, 2000).

As the above discussion has provided an understanding of the concept of capacity building, the following section elaborates the challenges in delivering the capacity building programs in the post-disaster reconstruction context.

2.2.5.3 Challenges in delivering capacity building programs in post-disaster reconstruction

Bolger (2000) argues that the increased interest in capacity development resulted from the inadequate attention to the long-term 'capacity' issues in the provision of development assistance, which eventually led to the limited sustainable impact in priority areas. On the other hand, Davos (1998) argues that the improvement in capacity has been undermined by a range of procedural concerns related to limited representation, conflicting value judgements and an overemphasis on the output of decision-making.

With regards to the involvement of the local people in the capacity building activities in a post-disaster context, Kenny (2007b) highlights five major reasons for the exclusion of the locals, based on their study in the tsunami reconstruction in Aceh, Indonesia. The first reason related to the urgency for a quick action and the scale of destruction. The second reason is due to the curtailed freedom to work with the locals by the government and military surveillance. This is particularly addressed to the situation in Aceh, as a conflict area. The third reason owing to the sheer complexity of the reconstruction, which is affected by the pre-disaster level of government authority and exercise of power as well as by the destruction of official records. Furthermore, she claims that the established paradigm of Eurocentric notions, which separates the worlds into 'south' and 'north' or 'developed' and 'underdeveloped' regions has been the fourth reason to the exclusion of the locals. She argues that this perception has led to viewing

externally generated building of the Western capitalist system, including its enterprise, governance, and democracy system as a 'natural' development implementation model, which often result in neglecting the ability or the necessity of local people to organise themselves independently. The fifth explanation is regarding the marketization or commercialisation of disaster aid programmes. The massive market and funds involved in post-disaster reconstruction turn foreign companies and consultant to look at disaster as an opportunity to develop themselves by obtaining a lucrative contract.

This section has provided in-depth discussion on the issues of capacity and capacity building, covering the general concept of the capacity and the challenges in delivering capacity building programs in the post-disaster reconstruction. Furthermore, as this study is focused on the maintenance of the post-disaster road infrastructure assets, the next section will accordingly provide a discussion on the issues of road infrastructure reconstruction in the post-disaster context, commencing with the importance of road infrastructure.

2.3 Reconstruction of road infrastructure in the post-disaster context

2.3.1 The importance of road infrastructure

Many studies have shown that improvement in the road transport infrastructure may provide positive impacts to the community in various ways. Crafts (2009) suggests that increased market agglomeration, productivity and labour supply resulting from reduced transport cost may create economic development opportunities for the community. Accordingly, improvement of the road networks, in particular, may provide positive impacts to the community due to better trade, communication and economic and social growth as well as increased international competitiveness (Anapolsky, 2002). It appears that the speed, flexibility and accessibility of the road transport in reaching virtually all points (Beilock et al., 2002) and in connecting other transport systems (Anapolsky, 2002) remains the important and distinct characteristics of the road networks compared with other means of transport. A study by Cheesman (1993) in Malawi demonstrates how increased accessibility and speed resulting from improved road infrastructure helped farmers move their crops efficiently to the storage and reduce their post-harvest crop losses. Another study by Bryan et al. (1997) exhibits how the construction of the A55 road network in North Wales, UK, resulted in the better access to the

local suppliers and the operational cost savings. In addition, at the construction phase, the A55 project was also estimated to have created more than 4,200 job opportunities with an annual income of more than £54 million.

Within the disaster context, a functioning road infrastructure plays an important role at all three stages of the disaster cycle; pre-disaster, disaster, and post-disaster. In the pre-disaster stage, which is the prevention and mitigation phase, well-planned road infrastructure may help avoid or minimise the impact of the disaster due to the application of preventive and adaptive design. Construction of road infrastructure that can withstand and cope with future disasters will help ensure the development sustainability and help prevent unnecessary losses resulting from the destroyed and non-functional facilities.

In the post-disaster emergency and reconstruction period, road infrastructure plays a crucial role. Grünewald et al. (2010) suggests that transport disruption into and out of the disaster affected area is a vital constraint to the provision of an efficient response to the emergency and post-disaster reconstruction activity in Haiti. Not only can a functioning road network save lives through enabling access for evacuations, it also enables the speedy distribution of aid into the affected areas. Similarly, in the reconstruction of Aceh, the collapsed road sections and bridges forced the distribution of donations and reconstruction materials to the isolated areas by the means of air and water transports, which resulted in both lengthy delivery and high operational cost. A similar case was also experienced in the disaster response in Mentawai, West Sumatra (Dharmastuti, 2010). Additionally, in the long-term post-disaster reconstruction stage, the functionality and serviceability of transport infrastructure have a great impact on the overall recovery process. For instance, Chang et al. (2011) argue that the poor transport infrastructure in Aceh has been among the factors that caused an increase in the transportation costs and construction lead-time; which resulted in the higher construction costs and project delays.

2.3.2 The impacts of disasters to the infrastructure

The scale of damages and losses in major earthquakes is in many cases overwhelming. Not only do earthquakes cost lives, but they also destroy buildings and infrastructure. For instance, the Japan earthquake and tsunami in March 2011 was recorded as the most expensive disaster in terms of economic losses (more details in the Table 2.2).

As shown in the table, the World Bank (2012) indicates that the losses and damages caused by the earthquake reached up to $210 billion, with around 17,500 people died Out of the total losses and damages, the social infrastructure sector suffered as much as $27 billion.

In the developing world, one of the biggest disasters in terms of losses and damages, as well as casualties was the Indian Ocean 2004 tsunami. With regard to the 2004 and 2005 earthquake and tsunami in Aceh and Nias, Bappenas (2005) describes that the infrastructure sector suffered almost 20% of the total estimated losses and damages. More details of the total losses and damages are presented in Table 2.3. The table shows that the overall losses and damages suffered by the infrastructure sector were more than US$ 876 million. The road infrastructure accounted for 35% of the total amount (Bappenas, 2005) and more than 2,600 km of road networks were destroyed (Sihombing, 2009). In addition, the tsunami reconstruction blueprint denotes that the needs for the rehabilitation and reconstruction of the road infrastructure in Aceh and Nias were more than Rp 6 trillion (Bappenas, 2005).

Table 2.2 – Losses and damages of japan earthquake and tsunami

Types		*Losses and Damages*
Casualties as of August 8, 2012	***Dead***	***17,500***
	Missing	***2,848***
	Injured	***6,109***
Building damage as of August 8, 2012	***Total collapse***	***129,316***
	Half collapse	***263,845***
	Partial damage	***725,760***
Evacuees	***Maximum (March 14, 2011)***	***470,000***
	Current (August 2, 2011)	***343,334***
Estimated economic damage	***Buildings***	***$129 billion***
	Public utilities	***$16 billion***
	Social infrastructure	***$27 billion***
	Other (agriculture, forests, fisheries)	***$37 billion***
Debris		***31.2m tons (July 2012)***

Source: World Bank (2012)

Since the reconstruction of disaster affected areas is generally implemented based on the build back better principle, which will try to rebuild the affected areas beyond their original

condition, the amount of funds for reconstruction are generally larger than what were actually destroyed.

Table 2.3 – Damage and loss Aceh and Nias earthquake 2005 (US$ Million)

	Total Impact			Property	
	Damage	**Losses**	**Total**	**Private**	**Public**
Social Sectors	**1674.9**	**65.8**	**1740.7**	**1440.6**	**300.1**
Housing	1398.3	38.8	1437.1	1408.4	28.7
Education	110.8	17.6	128.4	9	119.4
Health	82.5	9.4	91.9	23.2	68.6
Culture and religion	83.4		83.4		83.4
Infrastructure	**636**	**240.8**	**876.8**	**325.9**	**550.8**
Transport	390.5	145.4	535.9	165.8	370.1
Communications	18.9	2.9	21.8	8.6	13.2
Energy	67.8	0.1	67.9	1.1	66.9
Water and Sanitation	26.6	3.2	29.8	18.3	11.4
Flood control, irrigation and sea protection works	132.1	89.1	221.2	132.1	89.1
Productive Sectors	**351.9**	**830.2**	**1182.1**	**1132**	**50.1**
Agriculture and Livestock	83.9	140.9	224.8	194.7	29.9
Fisheries	101.5	409.4	510.9	508.5	2.5
Enterprises	166.6	280	446.6	428.9	17.7
Cross sector	**257.6**	**394.4**	**652**	**562.9**	**89.1**
Environment	154.5	394.4	548.9	548.9	
Governance and administration	89.1		89.1		89.1
Bank and Finance	14		14	14	
Total Impact	**2920.4**	**1531.2**	**4451.6**	**3461.4**	**990.1**

Source: Bappenas (2005)

The relationship between fund availability and the scope of post-disaster reconstruction has been discussed in section 2.2.3.2. Furthermore, the following section will cover the issue of road infrastructure planning and development process.

2.3.3 Road infrastructure planning and development process

Similar to other construction projects, the construction of road infrastructure also follows a series of steps and planning stages prior to the construction, operation, and ultimately the maintenance cycle. In more detail, the U.S. Federal Highway Administration describes in the

Project Development and Design Manual (FHA, 2008) the various aspects and activities that a road development project needs to put into account. The manual includes planning and programming, environmental stewardship, conceptual studies and preliminary design, surveying and mapping, geotechnical, hydrology and hydraulic assessment, safety and traffic design, highway design, structural design, pavement, right of way and utilities, and design feedback. Furthermore, a more generic process of road infrastructure planning and development can be seen as illustrated by the Finnish Transport Agency - FTA. The FTA divides the process of road planning and development into four phases; feasibility study, preliminary engineering planning, final engineering planning and construction planning (FTA, 2010). Once the construction is completed and the road is operational, the development phase is followed by the maintenance and upkeep activities to preserve the road to a certain level. More details of the process are presented in Figure 2.3.

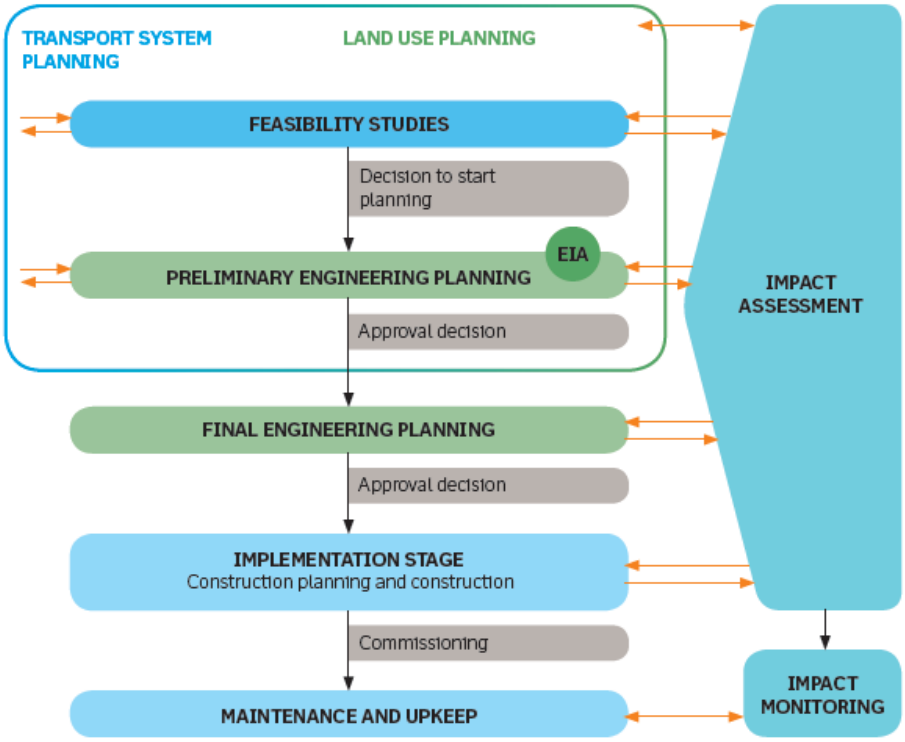


Figure 2.3 – Road Planning and Development Process

Source: FTA (2010)

The steps and processes of the road infrastructure planning and development as illustrated in Figure 2.3 cover the various aspects and requirements to justify the decision to build as well as the amount of investments made for a road infrastructure project.

In addition to the vertical relationship between the steps in the planning process, there are also horizontal relationship between road agencies and other stakeholders. For instance, the feasibility studies may include the environmental, social and economic feasibility. Accordingly, the planning process will need to include and involve various agencies such as the planning agencies, environmental bodies, and the finance agencies to assess the impact of the road project, as well as the benefit that it offers. In addition to the above feasibility studies, particularly aimed at protecting the indigenous people, (World Bank, 2009b) requires that project proposal should include an Indigenous People Plan, which identifies the impacts of the interventions to the indigenous people and areas. Such requirements are made to ensure that the potential negative impacts on the people are kept minimum.

Even though the process and steps are indeed necessary, the whole planning cycle may not be applicable in a post-disaster and emergency situation. The high pressure and needs to accelerate the reconstruction process may not allow for complete and diverse feasibility studies to be undertaken prior to commencing a road reconstruction project, as such a process will normally take a long time. Moreover, the high level of uncertainties and changes in the geographical condition also hinders the preparation of a final engineering design (Sihombing, 2009).

Having described the general overviews of the road infrastructure planning and development process, the following section elaborates major concerns commonly experienced in road infrastructure projects.

2.3.4 Concerns in Road Infrastructure Projects

The level of success of a project is often reflected in three performance indicators: time, cost and quality. This means that a successful project is completed within the specified project period, within the allocated budget, and to the intended quality. However, achieving all success factors in a road construction project is not a straightforward effort. Often, at least one of the factors would be compromised to achieve the remaining performance indicators. When the

final quality is non-negotiable, the time and cost components are compromised and occur in the form of delays and project cost escalation. Similarly, when time is strictly constrained, the quality and cost of the project may suffer.

Additionally, as an industry, construction is argued to have a higher degree of risk compared with other industries due to the many unknown, unexpected, undesirable and unpredictable factors that exist in every construction project (Kim and Bajaj, 2000). Accordingly, delays and the resulting time and cost overrun are universal phenomena in the construction industry (Ahmed et al., 2002) and road construction projects are no exception (Kaliba et al., 2009). These problems are more evident in the traditional or the adversarial type of contracts in which the contract is awarded to the lowest bidder (Adnan et al., 2009).

2.3.4.1 Risk management in road projects

Risk is generally defined as the combination of probability of occurrence and the resulting consequences. Even though risks are commonly regarded as a negative matter and may occur in every project, risks can actually be managed, and the resulting consequences may also provide opportunities. Mills (2001 cited in Perera et al., 2009) argues that risks affect the productivity, performance, quality, and cost of the project. Therefore, the capacity of the parties involved in a project in managing the risks would consequently determine the success of a construction project (Perera et al., 2009).

Within the context of risk management, Andi (2006) argues that construction risk cannot be eliminated and can only be transferred or shared through contract clauses. He also suggests that the management of risk is greatly influenced by the uniqueness of the construction industry in a specific country. In his study, he reveals a list of 27 risks associated with the construction industry. The top ten risks include changes in work, inflation, defective design, unforeseen site conditions, financial failure of the owner, delayed payment on the contract, deficiencies in specifications and drawings, acts of god, poor performance of suppliers and subcontractor, as well as safety issues (Andi, 2006).

With regard to road projects, Perera et al. (2009) identify 23 risk factors in road construction projects and classify them into four types of risk sources, namely; technical and contractual risk, economic, financial and political risk, managerial risk, and external and site condition risk.

Among other risks, defective design, late approvals, late handing over of the construction site, tentative drawings and unforeseen site conditions are highlighted and argued to have thwarted contractors on many occasions. More detail about the identified risks is presented in the following figure.

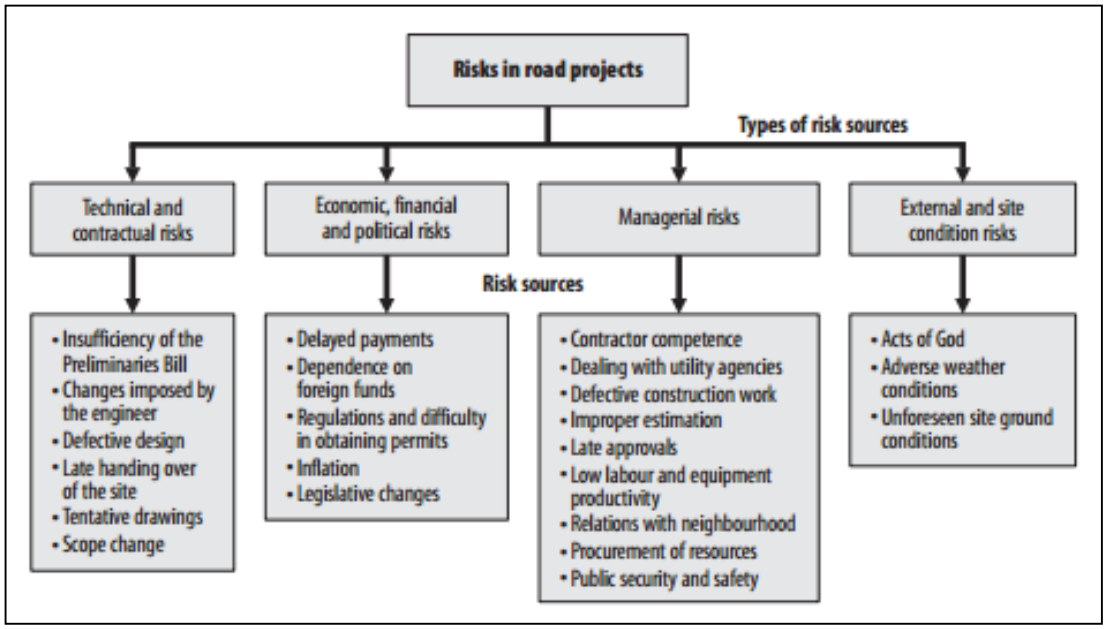


Figure 2.4 – Risk classification framework

Source: Perera et al. (2009)

When a road project is completed, the following concern which needs to be addressed is regarding the maintenance. Despite their initial build quality, road pavements deteriorate over time. Even though road maintenance is recognised by most road management agencies as an important aspect of maximising the value of capital funds invested in the road sector, road maintenance is often undermined and neglected. To provide a deeper understanding of the various aspects of road maintenance, a profound discussion is presented in a dedicated section, section 2.4. However, prior to discussing the road maintenance issues, the following section will provide a discussion on the consequences of the challenges commonly experienced in a road project; delays and cost escalation. The discussion that follows will be regarding the main challenges and obstacles in post-disaster road reconstruction.

2.3.4.2 Delays in construction projects

Project delays refer to a situation where the project implementation period exceeds the planned schedule. As far as time performance is concerned, delays in road construction projects are not uncommon. An extensive literature review on the causes of project delays has been conducted for the purpose of identifying the causes of delays commonly experienced in the construction project, with some particular references addressed to the road construction project. Since delays are commonly found in a construction project, various studies have been performed, and a number of methods have been developed to identify, avoid, respond, and settle disputes arising from delays. Odeh and Battaineh (2002) classified factors causing delays in construction projects into eight categories namely: client related, contractor related, consultant related, material, labour and equipment, contract, contractual relationship, and external factors. Similarly, Ahmed et al. (2002), simplify the causes of delays into two groups, internal and external. The internal causes refer to delays resulting from four parties involved in the project, namely contractor, owner, consultant, and designer. The external causes accordingly refer to delays resulting from parties external to the project, such as government, suppliers and weather. Based on the contractual operation, they further group delays into four divisions, namely non-excusable, excusable non-compensable, excusable compensable, and concurrent delays.

Looking more into detail on the global experience and studies of the causes of delays in the construction projects, the causes are generally typical with some slight variations between projects and countries. With the particular focus addressed to the construction project in the Gaza strip, Adnan et al. (2009) suggest that the main external causes for delays have been strikes and border closure, material scarcity and delays in material delivery to the construction site. Additionally, Majid (2006) highlights top ten most important factors contributing to the causes of delays in the construction industry in Aceh, Indonesia, as the insufficient numbers of equipment, inaccurate time estimate, monthly payment difficulties, change orders, inaccurate cost estimate, poor site management and supervision, inadequate modern equipment, shortage of construction materials, incompetent project team, improper project planning and scheduling, and contractor's financial difficulties. In Jordan, the most important causes of project delays include owner interference to the project, inadequate contractor experience,

financing and payments, labour productivity, slow decision making, improper planning, and subcontractors, (Odeh and Battaineh, 2002) as well as user changes, weather, site conditions, late deliveries, economic condition, and increase in quantity (Al-Momani, 2000). Similar causes of delays have also been found in America (Ahmed et al., 2002), Thailand (Ogunlana et al., 1996), Lebanon (Toufic M and Wissam, 1993) and Malaysia (Wa'el et al., 2007). Specifically focused on the road projects, delayed payments, financial processes and difficulties on the part of contractors and clients, contract modification, economic problems, material procurement, changes in drawings, staffing problems, equipment unavailability, poor supervision, construction mistakes, poor coordination on site, changes in specifications and labour disputes and strikes were highlighted as the main causes of delays in the road project in Zambia (Kaliba et al., 2009).

Whilst delays are commonly experienced in construction projects, Kaliba et al., (2009) argue that even though most road construction projects in Zambia experienced delays, most of the delays are actually controllable, except for some external factors such as weather and inflation. Albeit contract clauses generally express the risks of delays and the parties responsible for the consequences of delays are stipulated in the contract documents, the increasing size and complexity in nature of a project tend to complicate the conditions of contract leading to further disputes and litigations (Iyer et al., 2008). Ng et al. (2004) also argue that most delay analysis techniques are suitable to settle claims once the project is completed, with little helps for *schedule compression* or project acceleration to avoid delays of final project completion schedule.

Furthermore, as Iyer et al. (2008) suggest, the consequences of delays and dispute settlements may lead to greater losses as delays may hamper project progress, contribute to cost and time overruns, give detrimental effect to the relationship between owner and contractor, as well as sending bad signals to the foreign investors. Additionally, Ng et al. (2004) add that whilst initial responses to schedule delays are commonly in the form of schedule recovery, i.e. accelerating the remaining activities by exploiting more resources or application of alternative construction methods; delays will inevitably involve extra cost.

Having provided a discussion with regard to delays in the road construction project, the following section will discuss another issue commonly experienced in a road construction project, the cost escalation.

2.3.4.3 Cost escalation

Similar to delays, cost escalation in road construction projects is also commonly experienced and in fact occurs in most road construction projects (Odeck, 2004, Kaliba et al., 2009). A number of reasons have been accused as the main causes of cost escalation. From the planning and design perspective, The General Accounting Office of the United States - GAO (1997) states that, among others, cost escalation stems from three major causes: poor preliminary estimates, modification of preliminary estimates to reflect more detailed plans and specification, and changes in the scope of work. In an attempt to better estimate the final construction cost, Hegazy and Ayed (1998) develop a model to estimate the road construction cost in Canada by considering project's physical features, including the type of project, project scope, construction year, seasons, location, project duration, size, the availability of water, and soil condition. In addition, variations in bid prices submitted by contractors for a project may reflect the level of understanding, technology and methodology of bidding contractors which may affect their work performances and may accordingly affect the final project cost (Trefor, 2005). Furthermore, Kaliba et al., (2009) suggest that bad weather, scope changes, environmental protection and mitigation costs, schedule delay, strikes, technical challenges, inflation and local government pressures were the major causes of cost escalation in Zambia's road construction project. Other causes of cost escalation include reworks (Peter and Amrik, 2003) and design constructability (Trefor, 2005).

However, in addition to these common issues, road reconstruction in a post-disaster context may have to deal with issues that are unique in context and scale to post disaster projects; particularly in developing countries. More discussion on road reconstruction in a post-disaster context is presented in the following section 2.3.5.

2.3.5 Challenges and obstacles in post-disaster road reconstruction

In addition to issues commonly experienced in the implementation of road infrastructure projects in a normal development context, post-disaster projects have to deal with a

significantly more challenging situation. Post-disaster projects struggle with a more complex, dynamic and chaotic environment compared to the construction projects in a normal situation (Alexander, 2004). Hayat and Amaratunga (2011) state that the challenges in the post-disaster road reconstruction include finalisation of project design, land acquisition, corruption, administrative issues resulting from the combined and conflicting regulations, and unfamiliarity with the local conditions. While most of these risks are commonly found in road projects, the scale of the risks is in many cases undermined. For instance, most post-disaster infrastructure projects in Aceh adopted a design review concept, which determines only the basic concept, tender documents and estimated project value. This method was adopted in order to accelerate the reconstruction process (Sihombing, 2009). However, the implementation of road reconstruction projects, however, would need a 'final' design to be in place before the acquisition process of the land required for the project could commence (Hayat and Amaratunga, 2011). The process became more complex since the local governments, as one of the key stakeholders in ensuring the project sustainability, were also victims of disasters. More detailed discussion of the obstacles and challenges will be presented in the following section.

2.3.5.1 Relatively fewer aid agencies focused on the road reconstruction

A number of studies suggested that road infrastructure has a very important role to play in enabling an efficient and speedy recovery of post-disaster reconstruction (Grünewald et al., 2010, Chang et al., 2011). Regardless of the importance of the road infrastructure in the overall recovery process, however, very few aid agencies provide sufficient focus and funding allocation for the reconstruction of road infrastructure. The tsunami and earthquake in Aceh and Nias resulted in about 3,000 km of road networks impassable (BRR and International Partners, 2005). However, as Chang et al., (2011) argue, many aid agencies working in the post-tsunami reconstruction in Aceh underestimated the need to rehabilitate the road connections by not including it in their initial recovery plans. They further argue that the limited access led to many aid agencies experiencing a significant increase in the price of material required for the reconstruction in the housing sector. Some of the factors that caused the increase were the high transport costs and the procurement lead-time. Consequently, many of the aid agencies had to pay for their negligence in the form of project delays and increased material price, which often required revision of project scope and schedule.

In Aceh and Nias post disaster recovery, USAID and Multi Donor Fund (MDF), through its implementing partner the World Bank, were among the few aid agencies that allocated significant focus and funding for the reconstruction of road infrastructure. Whilst USAID focused its project on the Banda Aceh – Meulaboh access road, MDF projects were focused on infrastructure in general whereby the reconstruction of transport infrastructure was the main parts of its IRFF project (IREP-IRFF, 2008). On a relatively smaller scale, other aid agencies working on the road reconstruction also include ADB and JICA. International Labour Organisation (ILO) also contributed to the road reconstruction through labour based road rehabilitation program, which is mainly focused on the rural road, aiming at increasing the local capacity for road construction, and providing income through wages (ILO, 2005).

2.3.5.2 Finalisation of project design

Considering the amount of time and resources needed, developing an ultimate plan and design prior to the tender of a disaster reconstruction project is very hard, if not impossible. Therefore, the BRR adopted a design review concept, which determines only the basic concept, tender documents, and the estimated project value - leaving the details of the design to the awarded party. This was meant to accelerate most of the reconstruction projects, and was claimed to be an effective method (Sihombing, 2009). However, road reconstruction required a different approach and obtaining a 'final' design is an urgent priority for the commencement of the land acquisition process. As a result, there were significant delays in the road reconstruction project in Aceh. Some of the main causes of the delay were that road design and implementation plan had not been approved by the time it was needed. Changes to the design and scope of projects are not uncommon in road construction projects, both in the developed and developing countries, which is considered to be one of the most significant causes of project delays (Kaliba et al., 2009). In Aceh, this issue, along with frequent changes to the project scope due to budget thresholds and disagreement over the final road alignment (USAID, 2006) were the additional causes of the project delays.

Inevitably, variations and adjustments also occurred in the project implementation. However, for road reconstruction project co-funded between the GoI and the donor countries or organisations, there was little flexibility in the project total budget. One of the solutions to deal with the project cost escalation was to reduce the project's scope of work. As an example, many

of the IRFF road reconstruction projects were long sections of roads that were broken down into smaller packages of road segments. Some packages included the construction of culverts or bridges. Accordingly, to maintain the targeted quality of the road structures within the initial budget ceiling, changes in the scope of works often resulted in the reduction in the road length or the omission of some project items. The latter option may include the deferral of bridge construction into future projects. Consequently, many of the projects resulted in some sections being left with 'untouched' parts at the end of the road segment while some others may have a newly built road with temporary wooden bridges in between. Additionally, from a socioeconomic perspective, road design will also need to demonstrate its sensitivity to the indigenous society and somehow accommodate their needs into the design. Whilst the actual and long-term benefits to the society have yet to be assessed further, there were concerns from the community living along the new "American–style thoroughfare" in the Aceh West Coast area regarding the speeding traffic and their demands to be able to sell snacks along the road as they used to do (Perlez, 2006).

2.3.5.3 Land Acquisition issues

The reconstruction of Aceh West Coast road network consisted mainly of three major tasks; construction of new road networks, rehabilitation and improvement of existing road networks, and debris clearance. In some areas, many of the previous road networks had been submerged by the tsunami, leaving road realignment as the only option to connect the existing road networks. As it was in most areas in Aceh, the community settlements were established along the main road networks, and many of these settlements had developed into small coastal cities, which were highly dependent on the existing road networks as the only sensible land access into and out of their cities. Many of these cities were also devastated by the tsunami and in many places left almost no survivors. This situation eventually led to another issue, the land acquisition.

Indonesia recognises two types of land title, land that is formally registered with the National Land Agency (BPN) and land title acknowledged by the customary law (*Tanah Adat*). While the definition and application of this customary law vary between regions, the customary land title in Indonesia is, in general, a land parcel where the ownership of which is acknowledged by and attributed to a community, and it is therefore for the community to decide its use, transfers of

ownership and to solve the land-related disputes (IDLO, 2008). Indonesian law also regulates that once the customary land is registered and titled, the customary land right will then be annulled. However, the complexity and cost of land registration have been deterring the customary landowners to register their land with the *Badan Pertanahan Nasional* – BPN (National Land Agency) office. Additionally, as stated by Oxfam (2006) in its reports, only around 25 % of land in the tsunami-affected areas of Aceh was statutory-titled land, i.e. registered under the government laws with paperwork held by the landowners and in the BPN offices. This means that the official documents did not entirely reflect the reality of land use on the ground. This has been another challenge that may be unique to Indonesia and hence the scale of difficulties resulted from such a peculiarity is also unique to the post-disaster reconstruction.

Furthermore, land acquisition is a common constraint in a road construction project. Adversely affect the construction process, acquiring land for a project may become a lengthy process, particularly when the lands to be purchased are owned by the private sectors. In its audit report, USAID (2007) specifically addresses the issue of land acquisition as the highest determinant to completing the reconstruction project to the planned schedule and cost. Additionally, the Aceh west-coast road reconstruction projects had to deal with more than three thousand parcels of land, increasing the complex nature of the land acquisition process. In the tsunami affected area, not only had many of the road networks been washed away by the tsunami, hence requiring relocation of the road, but many landowners, personnel, and officers responsible for the land acquisition process were also victims of the event (BRR and International Partners, 2005, Fitzpatrick, 2006).

Adding to the number of land parcels, disputes also occur in the community between those whose lands were affected by the project. Many of the tsunami survivors, or their relatives, moved or lived in other areas and were not readily available on sites for discussion about the land acquisition issues. Eventually, land issues emerged and caused disputes and delays in the land acquisition process during the project implementation. There were cases where the community or individuals blocked access to construction sites claiming that their land had not been paid for or that the price negotiation had not been finalised and mutually agreed.

Table 2.4 – Damage to property rights and the land administration system

Damages	*Quantification of Damage*
Loss of BPN staff	***40 BPN staff in Aceh Province, 30% of staff in Kota Banda Aceh.***
Offices and equipment:	***6 BPN land offices destroyed or severely damaged, including Banda Aceh District Office completely demolished.*** ***Destruction of office and survey equipment, including computers, to support urgent record recovery.***
Damage to Government land books (the official register of land):	***10% of land books lost.*** ***Remaining 90% needing urgent conservation and restoration work***
Destruction of official land documents	***80% of land documents lost, including almost all cadastral maps.***
Damage and disappearance of property rights evidence:	***The destruction of much of the physical evidence of property boundaries and witness evidence held in the minds of those who perished.***
300,000 land parcels affected	***170,000 urban and 130,000 rural including 549 parcels on Nias affected by the tsunami*** ***60,000 (40,000 urban and 20,000 rural) and 240,000 non-registered Land Parcels:*** ***5% of titled land parcels were mortgaged, with mortgages registered by BPN***

Source: BRR and International Partners (2005)

In the Aceh post-tsunami reconstruction process, whilst anticipated, the significant amount of time and other difficulties related to the land acquisition were underestimated (USAID, 2007). The poor capacity and resources of the local government to manage the land acquisition process in such an extensive scale did not progress as expected. The prolonged process eventually resulted in delays to a level where funding allocation for purchasing lands from the BRR was no longer usable. In turn, the district government needed to allocate funds from its own budget, a process that required parliamentary approval and lengthy bureaucracy. Project wise, this also resulted in more delays.

Several alternatives were attempted by both the governments of Indonesia and USAID to speed up the land acquisition processes, including the establishment of a special committee by the local government and parliament as well as requesting the governor to exercise an “eminent domain procedure” (Perlez, 2006). Nonetheless, the latter option was rejected due to

additional grievances such as procedures might give to the community; an option that might have been taken in a normal development project.

2.3.5.4 Administrative problems

Since most of the road reconstruction project was funded or co-funded under the loan or grant agreement by donor countries, combined regulation and administration between the Government of Indonesia and the donor agencies were engaged in many parts of the project. The Indonesian Presidential Decree no 80/2003 stipulates that if any conflicting regulations occur between Indonesia's and donor's regulations in projects that are partially or fully funded under loan or grant schemes, then donor regulation would prevail. Accordingly, unfamiliarity with certain procedures and requirements inevitably occurred. In the initial phase of the USAID project, the implementation plan proposed by the Indonesian contractor, PT Wijaya Karya (WIKA), was not approved due to its non-compliance with the US requirement which caused delays to the project commencement (USAID, 2006).

Nugroho (2008) explains that delays in the road reconstruction project also occurred due to administrative issues such as delays in proposal approval, establishment of Project Management Unit (PMU), consultant recruitment and mobilisation, and retendering. Such delays led to further deterioration of road infrastructure, which resulted in the spreading of news and complains in the newspaper, giving more pressures to those involved.

Furthermore, from a different perspective, Brooks et al., (2010) highlight that the provision of aid usually comes with certain conditions that in some cases may lead to 'collusive' agreements, forcing the price level higher. The required condition may occur in the form of involvement of contractors or consultants from the donor countries, as a means of channelling donation funds back to the donor countries (Kenny, 2007b). This could be the case for the reconstruction of road infrastructure in Aceh, where most of the projects were funded or co-funded by donor countries. An example of such a high price difference could be seen in the reconstruction of Aceh West Coast road. WIKA was awarded a $12 million contract to reconstruct an 80 km long road section which tasks included (1) design and construct 20 km of new roads in four distinct segments and one bridge, (2) perform other road maintenance, repair and rehabilitation work, and (3) remove bridge debris. Conversely, Parson Global Service, a U.S. Architect-Engineer firm,

was awarded a $35 million contract to perform technical design reviews and supervise WIKA's reconstruction activities (USAID, 2006). Even though such a contrast in contract value may be seen as 'reasonable' from a national and international level of experience perspective and capability, the necessity of awarding such a contract to an international company is questionable if the overall project performance is considerably poor.

Additionally, delay in payment is known to be a major cause of project delays on a construction project. In their study, Kaliba et al., (2009) argue that delays in payment are the greatest cause of road project delays in Zambia. Delays in payment to the contractor, which may be caused by both project owner and contractor, add additional burdens to the contractors and to their financial cash flow, hindering their progress. This also appeared to be the case for the reconstruction of road infrastructure in Aceh. In most of the road construction projects, the local contractors and subcontractors employed in the project were also affected by the tsunami disaster. The involvement of the local contractors was inevitable as it was considered the key to achieving the reconstruction success and to ensuring the sustainability. However, very few contractors had the required qualifications. Moreover, prior to the tsunami, the development of Aceh in the broader context had not been progressing well as a result of the prolonged conflict (please refer to section 2.5.7 regarding the conflict in Aceh). This situation, in addition to the extensive number of projects to be delivered in the reconstruction process, increased the barriers that the local contractors had to overcome. Frequently, they had to rent equipment from other companies, which meant that the contractors became highly dependent on the project's cash disbursement.

2.3.5.5 Corruption Risks

A number of studies have been conducted with regard to the issue of corruption in the humanitarian actions following a disaster. Ewins et al. (2006) identify corruption risks associated with humanitarian activities and mapped them according to the phases, activities and benefiting parties. The study concludes that corruption risks in humanitarian actions are affected by pre-event corruption and transparency levels, value of relief activities and the condition of the affected area. With a score of 2.8 on the Corruption Perception Index (CPI) (where 10 being the least corrupt index), Transparency International (2010) ranks Indonesia as 110th out of the 178 countries in its 2010 CPI.

Consequently, as the tsunami was one of the most deadly natural disasters recorded in history, taking place in a region which had suffered a prolonged conflict, the risk of corruption in the reconstruction of Aceh was expectedly high. In public procurement, corrupt practices may occur in the form of awarding contracts to the best briber instead of based on the best price-quality value. Such practice may result in higher contract value or purchase of unnecessary items (Søreide, 2005), or fraud resulting from discrepancies between amounts paid to suppliers for goods and the quantity of goods delivered (Oxfam, cited in Schultz and Søreide, 2006).

Furthermore, corrupt practices in the developing countries are often seen to be common and a fact of life which are part of the business game (Ibrahim, 1993). Additionally, it is a common practice in a construction project to subcontract parts or most of the project to a number of subcontractors which may also result in a higher risk of corruption. In such schemes, project owners or consultants have little influence and authority over the subcontractors as their performance will be mainly the responsibility of the general contractor. However, this also means that regardless of the vast experience of the general contractors or consultants, project performance may be highly dependent on the subcontractors' capacities which in many cases are understandably and expectedly low. In 2006, the unfair and unreasonable subcontracting rates paid by the state-owned company PT Waskita Karya (WK) to its subcontractors was reported as the main cause of the project delay. This lead to the Turkish Red Crescent, as the project owner, cancelled 500 units out of the 1050 houses initially awarded to WK (Serambi Indonesia, 2006). The company was later added to the BRR's contractor black list. It was found that WK subcontracted the house construction to various subcontractors with a significant difference in the unit price ranging from Rp 68 million to Rp 82 million. Consequently, subcontractors receiving the lower unit price ceased construction. While this case occurred in the housing reconstruction project, similar practices might also happen in the road reconstruction projects.

2.3.5.6 Other challenges

In addition to the aforementioned challenges and obstacles, Nugroho (2008) adds that the reconstruction of road infrastructure in Aceh and Nias had to deal with the limited availability of professional and skilled human resources, issues between the contractors and local partners, security, price increase, and difficulties in obtaining a bank loan due to the global financial crisis.

The lack of professionally skilled human resources available in Aceh resulted from various causes. On the one hand, the scale of reconstruction activities was so substantial that they required a significant number of skilled personnel. On the other hand, the required level and the number of human resources might not be available locally, which was either due to the fact that most locals were victims of disaster, or simply due to the low capacity of the locals. Furthermore, when the tsunami hit Aceh in 2004, Aceh was in the middle of a prolonged conflict between GAM and the Government of Indonesia - GoI. Hence, recruiting personnel from outside of Aceh was also a challenge due to the security issue. When it was possible, it would also need to provide much higher wages. Also, at the lower level, there seemed to be a resistance from the local work force towards bringing-in labour from outside Aceh (Sihombing, 2009). Due to this reason, it is argued that while the security problem had been significantly abridged after the peace agreement between GAM and GoI in 2005, human resources remained a big challenge in the reconstruction of Aceh.

Another issue was regarding the joint partnership between the contractors and the local partners. The partnership between them might occur in the form of joint-venture, as a contractor-supplier, or as the subcontractors for the project. In the first case, the national and local contractor collaborated to form a joint venture and pursue a project. Some of the problems resulted from such collaborations were recorded in details by Sihombing (2009) as the following. In one case, a national-local joint venture company submitted the most expensive bid, but were adamant about winning the project. The condition further turned into a rage when there seemed to be no chance of winning. In another case, Sihombing (2009) highlights a case where a national company lost a procurement tender due to the local partners' lack of experience in the procurement of heavy vehicle equipment, and forcefully tried to justify their bid position. Accordingly, Sihombing (2009) suggests that in order to avoid threats from the bid participants who were eager to win, the procurement committee often had to work literally out of the public reach by moving to another city.

The above sections have provided in-depth discussion surrounding the road reconstruction issues in a post-disaster reconstruction context. The topics of the importance of road infrastructure, the concerns in the road infrastructure projects, as well as the challenges and obstacles experienced in the post-disaster road reconstruction have also been discussed.

Accordingly, the following section is dedicated to discussing the road maintenance aspect which follows immediately after the completion of the road infrastructure and accordingly forms the bases of the research questions.

2.4 Road maintenance

Improved road infrastructure may offer significant benefits to the road users through the provision of better access, comfort, and lower vehicle operating cost (Burningham and Stankevich, 2005). However, to obtain the long-term impacts of the road improvement, well-planned maintenance programs are required or otherwise the design-life may not be reached, and the investment may not yield the expected value. As expressed in the UNECA report (1987), the objectives of road maintenance are specified by the Zimbabwean road management agency as to preserve the capital investment, reduce vehicle operating costs, and ensure the safety of the road users.

2.4.1 The need of road maintenance

Road pavements deteriorate over time, and their structural strengths will gradually decrease to a level where maintenance intervention is required to restore their condition and extend their service life. The deteriorated pavements eventually affect the ride quality, safety, and increase the road user cost. Boamah (2010) summarises that road deterioration is primarily affected by the physical environment, traffic, material properties, road construction quality, design standards, and the age of the pavement. For a road network to be sustained over its designed life-cycle period, adequate maintenance must be allocated in accordance with its life-cycle (Robinson et al., 1998). If road maintenance is neglected, a number of consequences will occur. Martinez (2001) highlights that the most important consequences of road deterioration are:

- Exponential increase in vehicle operating cost and the resulting loss of efficiency in the road transportation system
- Increase in investment cost due to the earlier need for road reconstruction
- Increase in the number of accidents

Furthermore, from the financial aspect, poorly maintained road infrastructure deteriorates faster and the required remedies cost more than what it actually needs to maintain the road in the first place. A study of Harral and Faiz (1988) regarding the road maintenance in 85 countries concludes that as much as $45 billion worth of investment in the road infrastructure could have been saved by a provision of less than $12 billion of preventive maintenance. Another study confirms that the rehabilitation of a paved road after 15 years of lack of maintenance may cost as much as $200,000 per km, whilst the provision of regular maintenance for the 15-year period will only cost as much $60,000 per km (Heggie, 1996). Similarly, Brooks et al. (1989a) suggest that road construction that is properly maintained may be expected to last twice as long and is cheaper than the construction of a road to last twice as long without proper maintenance.

Furthermore, poorly maintained road infrastructure may also increase road user costs. This cost particularly incurs due to the blocked access during the rainy season, reduced travel speed, and shortened vehicle parts life caused by potholes and accidents. It is also argued that each dollar 'saved' on the road maintenance may result in an increase to the vehicle operating cost by $2 to $3 (Heggie, 1996). Furthermore, as the road condition deteriorates and gets more dangerous to pass, transport service will be more infrequently available and unreliable, before they cease completely (Done, 2008).

Poorly maintained road may increase the risk of accident to the road users. Potholes, cracks, corrugated and polished pavement, as well as the absence of road marks may cause accidents and result in injuries or deaths. Even though the well-maintained road may also increase the risk of accident due to the higher vehicle speed, for instance, accidents caused by a poorly maintained road may lead to legal claims from the victims. Atkinson (1997) summarises briefly that neglecting the road maintenance needs has consequently resulted in the liability claims from the road users as much as £600 million per year in the UK and US$ 400 million to US$ 850 million in the USA in 1991. Additionally, Atkinson also suggests that the actual cost of liability claims is much higher when the legal and in-house costs were included. As the population is more aware of the possibility to obtain compensation for injuries caused by the neglected defects and as the legal and in-house charge increases, the overall costs of liability claims will also increase over time.

In Indonesia, the government has been struggling to provide adequate maintenance of its road networks. Each year, the government of Indonesia can only allocate around 60% of the Rp 27 trillion (US$ 2.7 billion) required for the construction and the maintenance of the national road alone (antaramataram.com, 2010). The regional road networks are considerably poor, where less than 25% were in good condition and more than 50% were damaged (Table 2.10). Consequently, the poor road condition is predicted to cost road users as much as US$105 million per day and accused as one of the causes of the low investment growth in Indonesia (DoT, 2005b). Therefore, in addition to the provision of adequate funding for the development of road infrastructure, sufficient financial resource allocation is also required for the maintenance activities. The allocation will need to consider its overall life-cycle period in order to ensure sustainability and to achieve the maximum benefit of the investment.

Having presented the importance of the road maintenance, there is a necessity to understand the factors affecting the performance and the deterioration of the pavement. Accordingly, the following sections are dedicated to provide an overview of the factors affecting the performance and deterioration of pavement.

2.4.2 Factors affecting the performance and deterioration of pavement

Road pavements are generally designed to last for 20-40 years. There are a number of factors affecting the pavement performance which determines the pavement design life and the needs for maintenance. These factors can be considered as being “internal” and “external," relative to the road structure.

2.4.2.1 Internal causes

The internal causes are related to method and material properties, which contribute to the structural strengths of a pavement so that the road can achieve its designed life period and carrying capacity. These factors are considerably important and are reflected in the age of pavement and its deterioration time path (Harral and Faiz, 1988). The internal factors include construction quality, material standard, design specification and proper craftsmanship (Kendrick, 2004), and the age of pavement.

According to Harral and Faiz (1988), typically two-thirds of the pavement deterioration problems take place in the final third of the pavement design life. Within the first two-third of the period, also called as the grace period, road pavement may survive even without maintenance after which road maintenance needs may surge dramatically. This is probably why the allocation of road maintenance is often delayed until it is too late to rectify the level of damages which have occurred.

Furthermore, as previously mentioned, one of the factors affecting the road performance, which determine the needs of the road maintenance is the structural design of the road pavement. Even though the structural strength of the road pavements is also affected by other factors such as work methods and supervision quality, it is argued that road construction designers frequently ignore the possibility to perform future maintenance and mainly focus on other issues such as investment cost, traffic safety, aesthetic appearance, regional development and environmental effects (Karim, 2011). Karim also concludes that the problems rooted to six main factors, namely insufficient consulting, insufficient knowledge, regulations and specifications without consideration of maintenance aspects, insufficient planning and design activities, inadequate organisation, and demands from other authorities. Accordingly, the decision on selecting and determining road pavement designs and types is considered to be an important factor to predict the future maintenance needs and to achieve the design-life.

2.4.2.2 External causes

In addition to the internal factors, the external factors include environmental factors (Boamah, 2010), traffic loading (ACMA, 1976), and vehicle accidents. The environmental factors consist of the climatic condition such as rainfall, solar radiation, temperature and soil type and terrain condition, which affect the pavement performance. Intense sunlight and cold temperature may raise and lower pavement temperatures, leading to the thermal movement in the form of expansion and contraction of the pavement materials. This condition may lead to the pavement surface becoming fatigued and cause cracking to occur. Cracking on the surface may cause water ingress and gradual loss of fine and coarse aggregate and eventually affect the sub-grade stability. Additionally, swelling and shrinkage of the subgrade due to moisture movement may also cause cracking and heaving.

Traffic loading is the main external factor affecting the performance of a pavement. Pavement design should accommodate the estimated wheel or axle load, tyre pressure, the configuration of vehicle axles, and the number of axle loads to be carried during the design life. (ACMA, 1976). Additionally, horizontal forces on the pavement surface caused by vehicle breaking and turning wheels may cause slippage cracking to the pavement. This normally occurs in areas where the bond between the surface and base course is poor. Another factor that is not commonly mentioned as a factor detrimental to pavement performance is vehicle accidents. When vehicles collide in an accident, the resulting impact may cause damage to the road surface and nearby facilities such as guard rail and kerbs.

Harral and Faiz (1988) summarise the deterioration cycle of road infrastructure in a chart as shown in the following figure

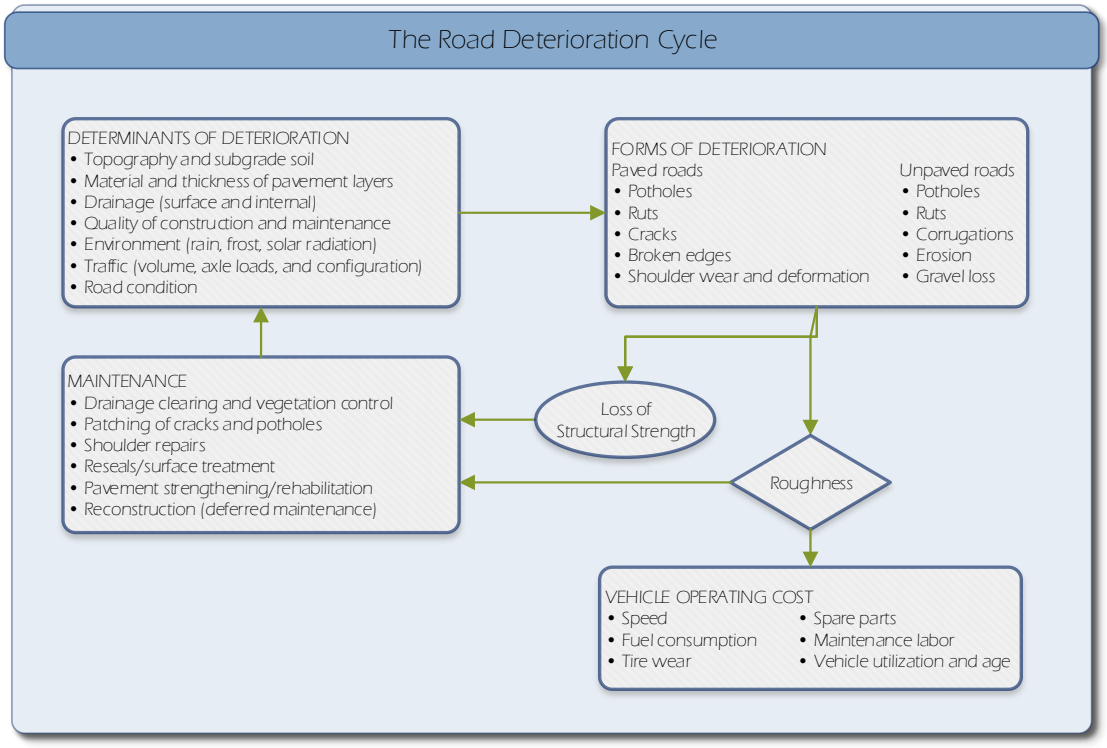


Figure 2.5 – The Road deterioration Cycle

Source: Harral and Faiz (1988)

As the causes of road deterioration have been elaborated in the above sections, the following section will discuss the various approaches that can be adopted in providing road maintenance.

2.4.3 Maintenance intervention

Based on the time period and frequency of maintenance works, Robinson et al. (1998) suggest that two approaches can be adopted; scheduled and condition-responsive. In the scheduled approach, maintenance works are carried out regularly based on the schedule which has been planned previously. This approach is appropriate when the deterioration rate is stable and maintenance work is predictable. Vegetation control and culvert cleaning are examples of maintenance activities that may use this approach. The other approach is condition-responsive. In the condition-responsive approach, intervention is triggered by the pavement condition, hence the name. A number of performance criteria are usually determined as the minimum requirement level. When the condition drops below the minimum level, intervention is performed to restore the pavement condition to the required level. The common performance criteria are roughness, surface distress, structural capacity, and pavement texture and friction (Robinson et al., 1998). Other maintenance activities that are performed based on the condition-responsive approach include emergency and winter maintenance.

Whilst maintenance interventions can be carried out based on the two approaches, the maintenance activities are generally classified into three categories; routine maintenance, periodic maintenance and rehabilitation. Routine maintenance activities include all works that occur regularly and frequently, and are carried out on an annual or monthly basis. These include vegetation control, drainage control, pothole filling and crack sealing. Periodic maintenance includes the activities which are required less frequently compared to the routine maintenance activities. An example of periodic maintenance activity is resealing the pavement which takes place every five years.

Even though routine maintenance activities are actually ‘periodic’ in terms of time scale and periodic maintenance is also ‘routine’ in terms of regularity of occurrence, the terms are given to distinguish the frequency of the required activity. Furthermore, even though routine and periodic maintenance activities are carried out regularly, pavements will still wear and deteriorates to a level where rehabilitation is required. Therefore, rehabilitation is performed to restore pavements to their initial condition. An example of rehabilitation is the pavement overlay, which takes place approximately every 10 to 15 years, depending on the design life and maintenance level. Figure 2.6 illustrates the various activities involved in road works, while

the maintenance activities included in each of the maintenance categories are presented in Table 2.5.

Table 2.5 – Maintenance Activities

Maintenance categories	*Maintenance Activities*
Routine Maintenance	***Vegetation control*** ***Drainage and culvert control*** ***Pothole fixing*** ***Crack sealing*** ***Etc.***
Periodic Maintenance	***Resealing***
Rehabilitation	***Overlaying***

Source: Bina Marga (1995)

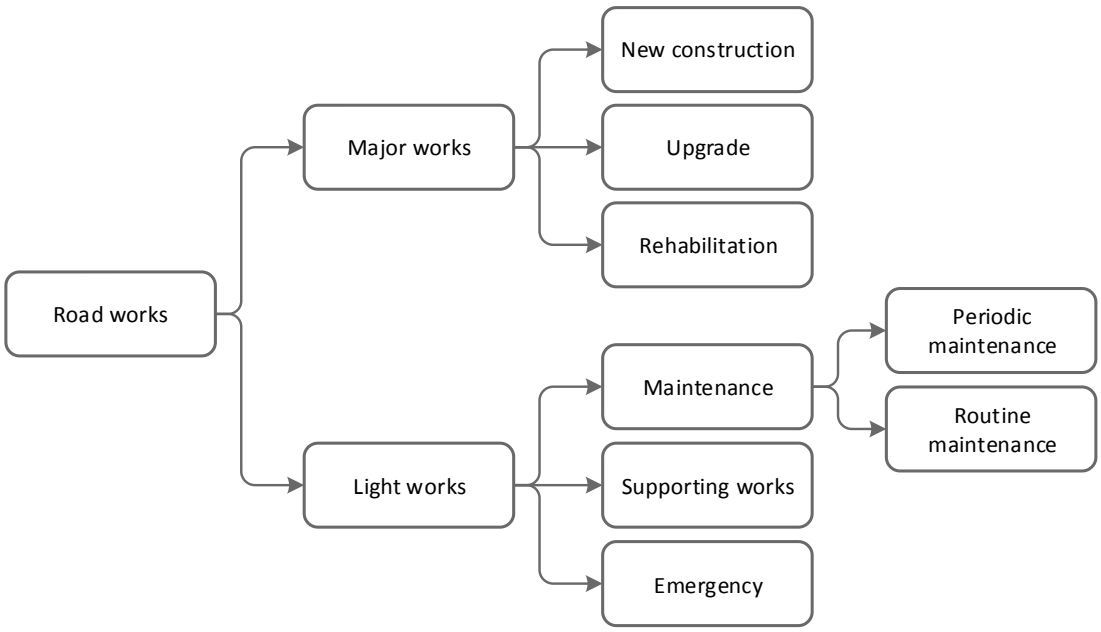


Figure 2.6 – Road works activities

Source: Bina Marga (1990)

Once the maintenance needs and the required activities are identified and planned, the following step concerns the party who is expected to actually implement the maintenance tasks. There are various ways in doing so, some of which will be discussed in the following section regarding the contracting methods.

2.4.4 Contracting methods in road maintenance

In performing the road maintenance activities, there are a number of methods that road authorities can adopt. The first option is to utilise the in-house personnel. This means that the maintenance activities are carried out by its own personnel. The other option is to contract some or all maintenance activities to the contractors. When a contracting-out option is selected, the in-house staff may act as supervisors for the project. Additionally, when contracting-out is selected as the method for performing the maintenance activities, road authorities can choose between the two types of contracting; method based and performance-based contract.

2.4.4.1 Method-based contract

In the method-based contracting, the specifications of materials, working methods, and the activities expected from the contractors are described in the contract. Contractors are responsible for meeting the specified work items and are therefore assessed and paid based on their ability to meet the required works. For instance, a method based contract will specify a number of potholes or length of road section where potholes need to be repaired. It will also specify materials and methods that the contractor needs to follow. The contractor may be paid based on unit price; e.g., the area of potholes repaired, or based on a lump sum amount - an agreed sum of money for a set of works. This is why the method-based contract is also known as a unit price or lump-sum contract.

In the method-based contracting, the contract also specifies a list of works and the time scale expected from the contractor to complete the works. The contractor may or may not receive incentives from the project owner (i.e., road authorities) for completing early, but normally, the contractors will be fined for their late completion or delays.

2.4.4.2 Performance-based contract

A Performance-based contract takes the opposite approach. Instead of specifying what contractors need to do, performance-based contracts list the minimum performance expected to be provided by the contractors. In a performance-based contract, the contractors are required to deliver a ‘product’ and therefore, the methods of works and material selection are generally decided by the contractor.

By adopting the performance-based contracts, road authorities transfer the risk associated with the road maintenance to the contractors. Accordingly, contractors who accept the risks also have the opportunity to gain more profit by performing a more effective and efficient design, process, technology or management (Zietlow, 2004). He also adds that performance-based contracts give the advantages of reduced maintenance cost through the application of more effective and efficient technologies and work procedures, provide transparency to road users, road administration and the contractors, improved control and enforcement of quality standards and improved overall road conditions.

Furthermore, Zietlow (2004) suggests that adopting performance-based contracts for road maintenance may result in cost reductions of between 10%-20% compared with the traditional method-based contract.

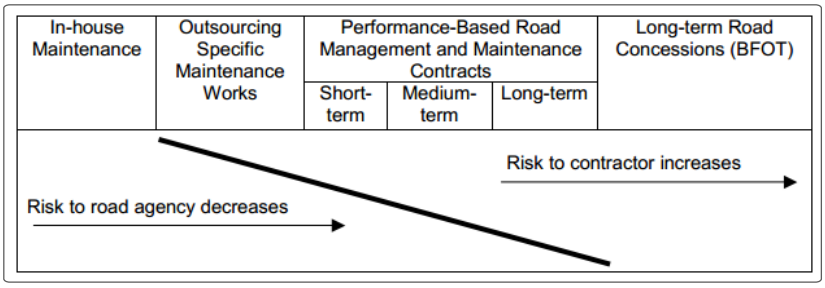


Figure 2.7 – Distribution of risks to road agencies and contractors using different forms of performing road maintenance services

Source: Zietlow (2004)

Figure 2.7 shows that by using in-house staff, road maintenance risks are borne solely by the road agencies. When outsourcing (method-based contracting) is adopted, some of the risks are transferred to the contractors. Furthermore, in performance-based contracts, the longer the contract term, the more the risks are transferred to the contractors. When the long-term road concession method is used, the risk is transferred to and solely borne by the contractor.

2.4.5 Common issues in the road maintenance

In general, the main problems in maintaining the road infrastructure are rooted in the institutional and financial issues, with some references to the technical, organisational, and human-resource issues (Heggie, 1994). More structurally, Robinson et al. (1998) classify factors

affecting the performance of the road management agency into two broad categories, internal and external, relative to the road management agency.

The internal factors are those within the control of the agency. On the other hand, the external factors are accordingly issues, which are out of the direct control of the road administration agency. These may include the physical environment, legal and regulatory framework, the socio-cultural background of the country, political situation, macro economy and the national resource availability, overall government employment policies, and relationship with other institutions. More details of these factors are presented in Figure 2.8.

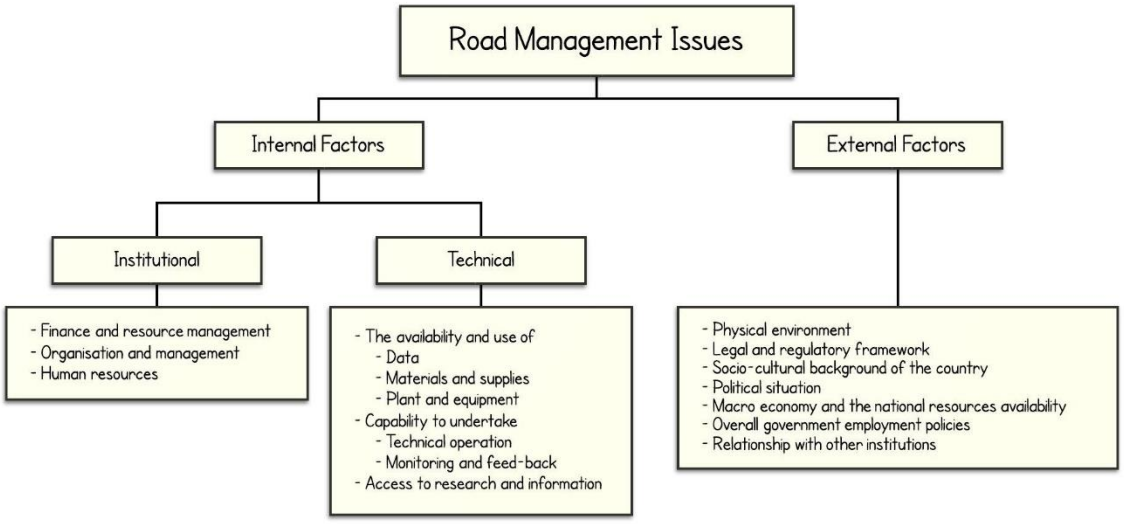


Figure 2.8 – Road Management Issues

Source: Robinson et al. (1998)

Even though these affecting factors are divided into different categories, they are not mutually exclusive and are in fact related to each other. For instance, the availability and use of data may be affected by the availability and sufficiency of fund allocation, which could be caused by the political interference and the macro-economic condition.

As further discussed below, a number of studies have identified common issues related to the road maintenance. These common issues include fund competition, division of responsibilities between central and regional government, politicised priorities, lack of customer focus,

perverse monetary incentives, inefficient work methods and inflexible term and conditions of the civil service (Heggie, 2003). Despite the rapidly deteriorating road infrastructure due to the maintenance neglect, developing countries tend to expand their road infrastructure without giving adequate priority to maintaining the existing networks (UNECA, 1987). As Klockow and Hofer (1991) suggest, road maintenance neglect may lead to increased vehicle cost, severe damages requiring re-construction of road, unbearable financial needs, and accelerated deterioration due to the heavier and more frequent traffic.

Martinez (2001) also examines the experience of road maintenance in the sub-Saharan African countries and concluded that the road deterioration problems are rooted to the following problems.

- The financial constraint, leads to road maintenance financing difficulty
- Traffic growth and axle overload exceed forecasts
- Technical constraint affects road maintenance quality
- Highway administration lacked technical and management capability
- ODA donors failed to supervise their projects and to coordinate their actions

The next sections will provide a more detailed discussion of the internal and the external factors affecting the road maintenance performance.

2.4.5.1 Internal Factors

As previously described, the internal factors refer to issues which are within the control of the road management agency. The internal factors can be categorised into two groups, those which are institutional and those which are rather technical.

2.4.5.1.1 Institutional factors

Following the Robinson et al. (1998) approach of classifying the road maintenance issues, the institutional factors include financial and resources management, organisational management and human resources. The following section will elaborate these issues in more detail.

2.4.5.1.1.1 Financial

From the financial aspect, financial management capacity and funds sufficiency are often referred to as the main sources of challenges in the road maintenance, particularly in the developing countries. As Talvitie (2000) summarises, there are five sets of costs need to be considered by the road administration namely the construction cost, rehabilitation and periodic maintenance cost, routine maintenance and system operation cost, road user costs, and external cost to society. The latter include pollution, development, and production benefits. The road management agency will therefore need to calculate the most effective expenditure allocation in order to achieve the optimum total road cost (refer to Figure 2.9 below).

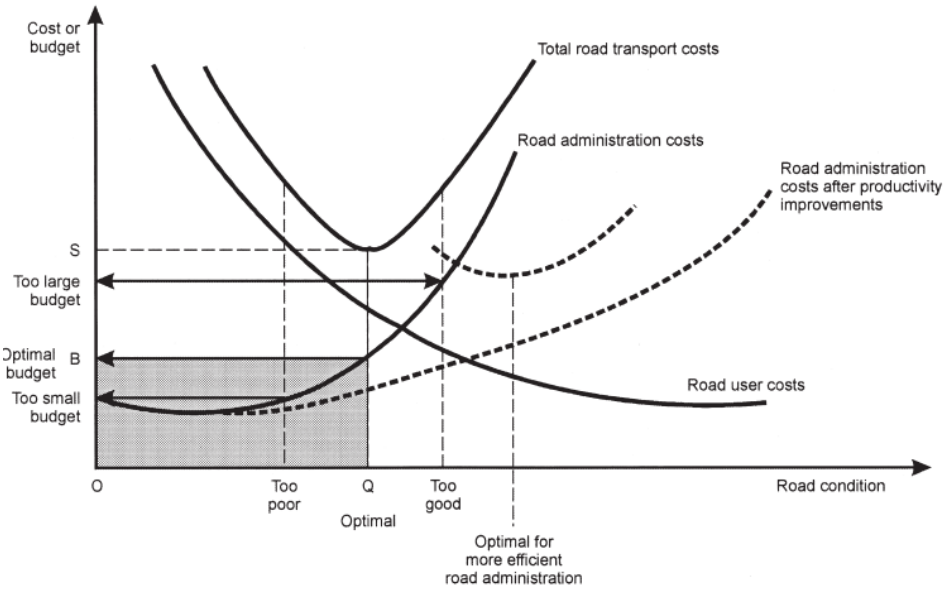


Figure 2.9 – Optimization of the road condition and road budget

Source: Talvitie (2000)

The above figure shows the relationship between the road condition and the cost or budget allocation for the maintenance. As road condition gets better, the administration cost increases and the road user cost decreases. The optimum and efficient expenditure will be achieved where the balance between the two meets. This is where the road administration expenses do not exceed the savings made in the road user cost. The dotted lines show the changes in road condition and expenditure resulting from the improvement in the road administration productivity.

According to ADB (2003), there are a number of reasons behind the poor allocation of funds for the road maintenance and these reasons include the political, cultural, and social background. Whilst these problems are common in most countries, developing countries face additional problems, such as low income per head, acute shortage of revenue, weak governance, lack of qualified local consultants and contractors, and weak legislation (Heggie, 2003). Furthermore, ADB (2003) argues that the problems with the road maintenance are typically due to the insufficient allocation for the maintenance needs and that eventually much less is actually spent. The ADB also suggests that while on the one hand fund allocation is insufficient, the allocated fund is also inefficiently used, typically shown by the large workforce with low productivity, hence most allocations are spent for wages.

With regards to the financial support, road maintenance commonly receives low priority, particularly when it needs to compete with other sectors such as the education and health sectors. The global experience proves that when the budget allocation for the road maintenance has to compete with other sectors, the road maintenance normally loses in priority, despite the suggestion that adequate maintenance should have the highest priority on the resource utilisation (UNECA, 1987). It is argued that such a condition occurs since the benefits of maintaining roads have not been widely understood by the decision-makers and the consequence of inadequate maintenance is not always immediately obvious (Potter, 1997). In other words, it is hard to convince the politician to secure funding and to allocate funds to repair roads that do not seem to be broken (ADB, 2003), regardless the fact that billions of the capital investment made in the road sectors will be eroded due to maintenance neglect, as experienced in the Sub-Saharan Africa (Heggie, 1994).

Accordingly, to obtain sufficient and sustainable financial resources required to fund the road maintenance needs, there are several alternative resources that can be exercised, which include taxation, toll roads, external financing assistance, earmarking revenues, and the establishment of road funds (UNECA, 1987). However, the global experience shows that the difficulties in providing sufficient funds for the road maintenance have been addressed primarily by earmarking certain related taxes and charges into a dedicated account, so-called road funds. Road fund is a mechanism to collect road-user charges directly from the vehicle users. The main principle of road fund mechanism is to treat road infrastructure networks as a

business and to provide the market on a fee-for-service basis (Heggie, 1999). The establishment of the road fund scheme was initiated by the fact that the developing and transition countries are struggling to fund their road maintenance needs since the road sector needs outgrown the government's tax revenues. Looking at how big the scale of the road infrastructure, it is accordingly argued that road assets need to be managed in a business-like approach, where users need to pay for using the road networks (Heggie and Vickers 1998). Accordingly, those who use the roads are charged for the services they get from the road networks. The charges are typically collected as a proportion of the fuel-levy and vehicle licences, and the funds are managed by a dedicated body.

Currently, the methods of financing the road maintenance needs through the road fund scheme has developed into the second model, commonly addressed as the 'second generation' road fund. The 'first generation' road fund was established in 1988 when the World Bank launched a Road Management Initiative (Potter, 1997). This first generation of road funds comprised of earmarking revenues from the road users into the national account and is administered by the government officials. However, this mechanism was not successful and some even failed completely (ADB, 2003). ADB further argues that the failure of the first-generation road fund mechanism rooted to three issues. First, as the revenue is collected and administered by the government officials in the national account, it is vulnerable from being raided and used for other purposes. Second, the required funds may not be released timely and sufficiently, causing a further backlog in the maintenance. Third, the funds collected under the road funds user charge mechanism may not entirely be deposited in the road fund agency, an example of which is when the state-owned petroleum company retaining revenues intended for road funds during the economic recession.

This condition led to the development of 'second generation' road fund. The second generation road fund requires funds to be managed by a dedicated and independent body, generally focused only on the maintenance of road infrastructure. The second generation road fund appears to be more successful. It involves the collection of road user charges and administration by an independent board consisting of the public and the private sectors. The aim of the second generation road funds remains in ensuring that the funds are spent effectively and efficiently, giving the road users the best value for money.

Another possible approach is through the cost-sharing mechanism. In such mechanism, financial support from the road fund administration is made available on a cost-sharing or fund-matching basis. However, this approach seems to be difficult to implement where the local government lacks the resources to contribute from their own local revenue.

In the case of Indonesia, in order to improve the road condition and help ensure the sustainability of the road infrastructure, the Indonesian government has initiated the establishment of a road fund agency as stipulated in Law no 22/2009. However, the road fund agency has not been functioning and its supporting mechanism and regulations have not been clearly defined. Until the road fund agency starts functioning, it seems that the road maintenance will continue relying on fund sourced from the general expenditure and the normal budgetary system.

Whilst most countries are leaning towards accepting the road fund scheme as an effective means to providing sustainable financial resources to the road maintenance needs, Potter (1997) underlines that a dedicated road fund scheme is only a means to delivering efficient road maintenance services. Moreover, even though the road fund model seems to be a sustainable and viable resource of financial needs for the road maintenance, the main concern lies in carefully setting up the fund collection and distribution method to reduce the possibility of fund being diverted away from the local road maintenance (Robinson and Stiedl, 2003). As the financial aspect has been discussed, the next section presents the institutional capacity.

2.4.5.1.1.2 Institutional capacity

With regards to the core problems of the road maintenance issues, the report of UNECA (1987) acclaims that the main cause of road deterioration problems related to the institutional capacity. In supporting the argument, Robinson (2006) suggests that even though most developing countries insufficiently finance their road maintenance needs, lack of financial resources is not the only causes of the road management agencies' poor performance. In most cases, there is also a need to strengthen and improve the organisational management and the regulatory arrangement.

From the organisational and management aspect, learning from the experience of the Sub-Saharan African countries, the institutional problems in the road maintenance rooted to the

poor management and the lack of enabling environment within the road agency, which undermined the need to provide incentives and to increase staff motivation (Heggie, 1994). More specifically, Heggie (1994) further argues that the problems include unclear managerial responsibility, poor terms and condition for staff, poor leadership, little managerial autonomy, keeping accounts to ensure that budget is not over-spent, no independent source of revenue, as well as the lack of independent external audit. World Bank, cited in Klockow and Hofer (1991), adds that the main issues in the road maintenance problems are caused by misallocated fund, unsound maintenance strategies, inefficient implementation, and lack of public pressure for better roads.

Furthermore, UNECA (1987) argues that road damage could have been contained should the institution operates in a more effective, responsible and attentive manner. It points out that the institutional reforms may be addressed by increasing political attention to road maintenance, strengthening the accountability of the road management agency, and by appreciating the performance through the introduction of incentives. It is also suggested that strengthening the road management accountability, in particular, should be achieved by linking budgets with the physical outputs, separation of planning and evaluation tasks from the executing agency, and monitoring of road conditions. Moreover, UNECA (1987) emphasises that in order to improve the utilisation of the road system and therefore facilitate the movement of people and commodities, a successful road management agency would require competent planning, designing, financing, and scheduling capacity, in addition to providing training to the human resources.

Another point worth emphasis is that even though a proper road maintenance plan needs to be prepared for the medium and long term period (e.g., three, five or ten-year period), the budget allocation is normally allocated on annual bases. Hence, the maintenance strategy (e.g. budget allocation, work priorities and scope of works) selected for each year may affect the maintenance plan of the subsequent year. To put into practice, any unfinished or neglected maintenance work will need to be added in the subsequent year plan. However, the financial needs will eventually be more than the initial estimates as the pavements continue to deteriorate, requiring greater maintenance interventions at the greater costs. Therefore, not only such condition illustrates the importance of regularly modifying and updating the

maintenance plan it also demonstrates that neglecting immediate maintenance requirements would eventually add burdens to the subsequent year plan and increase the total maintenance budget needs.

However, as highlighted by Klockow and Hofer (1991), the road maintenance problems do not exist in isolation and in fact embedded in a system which comprises many elements. As also suggested by UNECA (1987), road maintenance efforts should address the issues concerning the encouragement and the provision of training for the road maintenance personnel, effective distribution among relevant institutions, establishment of effective transport regulations, improve controls and monitoring, and the use of simple method of inspection. The above discussion concludes the discussion on the institutional factors of the road maintenance problems. Accordingly, the next section will discuss the technical factors.

2.4.5.1.2 Technical factors

The technical aspect of the road maintenance covers the availability and use of data, materials and supplies, and the plant and equipment; the capability to undertake technical operation, monitoring, and feed-back; and access to research and information. This section will accordingly highlight the major external issues experienced by the road administrations.

To adequately and properly produce a good-quality road maintenance plan, the road management agency would be required to utilise a maintenance management system. The tool would assist the road administrator, planners and the field staff to determine the financial needs, setting up priorities, and produce implementation programs, and for the road monitoring team to predict the time that pavement distress had been reached. Such tasks are made possible since the management system provides better prediction models of the pavement performance and vehicle operating cost, as well as computerised analysis which enables the evaluation of the vast array of options (UNECA, 1987). It further suggests that the information from the database will also assist the preparation of the life-cycle analysis of the pavement in order to optimally generate the construction-maintenance-rehabilitation strategy and minimise the total costs.

However, the road management system also needs to establish a database, and more importantly the maintenance and regular updates of the database to reflect the actual

condition. Unfortunately, the accuracy and the quality of the information provided by the maintenance management systems are highly dependent on the operators rather than the process of procurement and setting up the computer hardware and software. Therefore, the system needs to engage expert advisory services and provide adequate training for the local personnel. Nevertheless, as previously indicated, the biggest challenge in the management systems remains in the commitment of the senior management to allocate fund and sustain the trained staff for the management of the system, which is commonly neglected soon after the installation (ADB, 2003).

Furthermore, as presented by UNECA (1987), there has been a great interest within the road management agencies to utilise modern methods and techniques of road maintenance, maintenance management systems, and the maintenance road equipment. However, such a high interest has been hindered by the unavailability of the financial resources and local labour, even though certain maintenance operations require the use of such equipment.

The above sections have provided profound discussions on the internal factors of the road management issues. Accordingly, the following section will elaborate the external factors.

2.4.5.2 External Factors

External factors are those which are beyond the direct control of the road authorities. As discussed previously in section 2.4.5.1.1.2, one of the concerns that need to be addressed to improve road management capacity is by establishing effective transport regulation and monitoring method. With regard to regulation, UNECA (1987) highlights the need to implement strict monitoring of vehicle imports, enforcement of tax levy based on axle load, promotion of multiple axle vehicles, and the development of measures for weight restriction monitoring. However, as described by ADB (2003), the problems in road management are not only due to the weak planning and programming produced by the road management agency, but also due to the political interference in the day-to-day operation. More discussion on the political aspect will be covered in the next section.

2.4.5.2.1 Politicised decision making process

In the developing countries, decisions are often made based on consensus instead of economic rationale and therefore road is often seen as public service, not a business (ADB, 2003). As a result, many governments in the developing countries fail to see the importance and the economic benefits of preventive road maintenance. Consequently, many governments opt to pursue the more expensive curative approach which is to rehabilitate the road networks when they are heavily damaged. In another case, in order to reduce the social jealousy, it is considered more important and politically 'attractive' to pave new road and reduce the isolation of a village instead of spending money for maintaining the existing road of the neighbouring villages (ADB, 2003). In similar fashion, UNECA (1987) further stressed that the attitude of the decision makers towards road maintenance frequently and adversely affects the road condition as the politicians promote construction of new roads in order to seek prestige, planners favour the capital projects as the developmental benefits are relatively easier to measure, and that senior engineers prefer to have new construction works rather than maintenance due to the relatively greater project values. In Indonesia, for instance, even though on the one hand, there are indications of increased needs and dependencies towards road infrastructure, and the Indonesian government is struggling to further develop its road infrastructures, the existing road networks are suffering from poor maintenance and deteriorate rapidly (more detail is presented in section 2.5.4). Correspondingly, Klockow and Hofer (1991) propose that the urgent solutions to address the road maintenance problems are by establishing the required institutions which work efficiently, meeting the technical requirements, and allocating sufficient maintenance financial needs.

Accordingly, one of the efforts towards improving road management from the external aspect is by decentralising the road management authority from the central agency to the lower level of institution. In fact, decentralising road management authority is becoming a more common approach to addressing issues in road maintenance. More discussion on the decentralisation of road management authority is presented in the following paragraphs.

2.4.5.2.2 Decentralised system

The developing countries are decentralising the road management administration. It is argued that the decentralisation is expected to improve the rural road services by increasing the efficiency and effectiveness in the delivery of services and in responding the needs of the constituents (Robinson and Stiedl, 2003) through alleviating the decision-making bottleneck, simplifying bureaucratic procedures, and increasing sensitivity to the local conditions and needs (Robinson and Stiedl, 2001).

Decentralisation is defined as the transfer of power, resources and responsibility for planning and management from the higher level to the lower level of governments (Jütting et al., 2005) or other bodies (Robinson and Stiedl, 2003). With regards to road infrastructure, the decentralisation of road administration is therefore the transfer of responsibility of road management from a centralised body to the subordinate level bodies. In turn, decentralisation is expected to be the instrument that encourages broader participations of citizens and ultimately lead to increased efficiency and improved governance (Jütting et al., 2005). Accordingly, in a decentralised system, the responsibility is transferred to the agencies or subordinate level of organisations, which may well represent the constituents. These agencies may include the field unit of government agencies, subordinate level of governments, semi-autonomous public authorities, and private or voluntary NGOs (Rondinelli et al., 1989). However, disregards to the aims of decentralisation, there are concerns that decentralisation may erratically place responsibility for road maintenance to incompetent organisation (Robinson and Stiedl, 2001).

The above sections have elaborated factors affecting the road maintenance capacity, which can be classified into internal factors (section 2.4.5.1) and external factors (section 2.4.5.2). However, these factors do not normally occur in isolation. In fact, these factors are related to each other, which will be elaborated in the following section.

2.4.5.3 Relationships between the affecting factors

As previously stipulated, the internal and external factors affecting the road maintenance capacity are inter-related to each other. In order to describe these relationships, Brooks et al.

(1989b) adapted Adair's model (1983) regarding the effective leadership to link all the factors affecting the performance of the road management agency.

In the modified model, the environmental, tasks and individual capabilities are replaced with the institutional, technical and management capabilities the interdependence factors to effective organisation. Accordingly, Brooks et al. (1989b) suggest that improving the institutional arrangement is more difficult than introducing specific management or technical advances. They therefore conclude that improving the institutional capacity forms the basis for an effective and sustainable managerial capability to be developed. The relationship is then presented in a 'pyramidal' model which is illustrated in Figure 2.10a below. Additionally, the model also suggests that the implementation of changes to improve the performance of the road administrative requires the pyramid to be built from the bottom component to the upper ones.

Furthermore, Robinson et.al (1998) propose a set of recommendations for steps in implementing changes in the road management sector, by adopting the Brooks et al. (1989b) pyramid approach as shown in Figure 2.10b. These recommendations can be summarised as the following.

- Address the external factors; gaining political commitment, possibly by the involvement of road users and other stakeholders; agreeing the restructuring policy and institutional framework; framing any legislation required to support the changes; securing and maintaining the availability of sufficient funds for the implementation of policy.
- Address the internal institutional factors to improve effectiveness and efficiency
- Address the technical factors

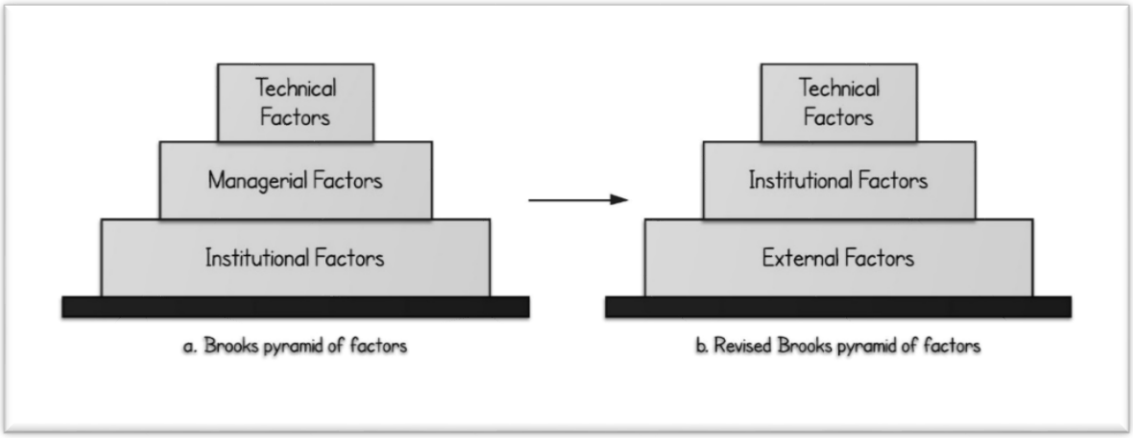


Figure 2.10 – Brooks Pyramid

Source: Brooks et al. (1989b)

Not only does the pyramid model illustrate the need to implement changes from the bottom element to the upper ones; the model also demonstrates that the elements on the lower part act as the enabling elements for the upper ones. Hence, it suggests that promoting changes on the technical aspects may not be effective and efficient, if not impossible, if the institutional factors are not sufficient. Accordingly, modifying the institutional arrangement may not be productive should the support required from the external institutions (i.e. political commitment and the regulatory framework) is not obtained adequately.

As the above sections have covered various factors affecting the road maintenance capacity, the following section will provide a discussion on the global experience attempting to solve the road maintenance problems.

2.4.6 Road maintenance capacity improvement efforts

Some of the efforts to overcome the road maintenance problems have been through increasing the road user taxes, reducing permanent workers and encouraging the involvement of the private sectors, as well as the use of a sophisticated computer-based pavement management system to help in the planning and programming of maintenance works (ADB, 2003). In the final report of the fourth African Highway Maintenance Conference, UNECA (1987) proposes a set of recommendations for the road maintenance issues in Africa, which include utilisation of contract-maintenance, the establishment of autonomous equipment pools, productivity

performance bonuses, road funds and revolving funds, as well as the implementation of labour intensive methods in the maintenance operations.

Even though such efforts have been made, there are challenges that hinder the effective and efficient road maintenance initiatives. For instance, ADB (2003) underlines the experience where increasing the road taxes does not ensure the sufficient allocation and expenses for road maintenance, involvement of private contractors for the maintenance works was troubled by delayed payment, erratic workload and inflation, or magnified bid price to cover the risks eventually diminished the intended savings. Additionally, with regards to the availability and use of data, ADB (2003) highlights that even though the problem can be overcome with the installation of a sophisticated pavement management system, the challenges remain in the consistent use, update, and operation of the system, which is generally neglected soon after the installation due to lack of fund and support from the senior management, and the high staff turnovers.

With regards to the rural roads development, Donnges et al. (2007) conclude that the efforts of reducing poverty in the rural areas by the means of improving access can only be justified if sufficient attention is also addressed to the maintenance needs which will ensure the sustainability of the physical access. They further highlight the success of the rural road development program in India, the PMGSY, which included the needs of future maintenance up to five years after their completion in the road rehabilitation contracts prior to fully returning the maintenance responsibility to the local authorities. However, they also emphasise that budget allocation sufficiency is often spoilt by the inability to expend the allocation, which is affected by the personnel capacity and the irregular apportionments of the budget allocation.

The above sections have provided in-depth discussion on the disaster management and the road maintenance aspect. Section 2.2 elaborates the issues regarding disaster and disaster management, while section 2.3 and section 2.4 respectively discuss the issue of post-disaster reconstruction of road infrastructure and the road maintenance aspects.

Additionally, as presented in section 1.1 of Chapter 1, the world is facing a significant increase in disasters, both in the number of occurrence and in the number of losses and damages. The statistical data suggests that the three most destructive natural disasters - storms, earthquakes

and flood, frequently occur in the developing countries. The Inter-American Development Bank highlights that while 75% of the world population are concentrated in the developing countries, they suffer 99% of the mortality caused by the natural disasters (2010). Furthermore, in the last three decades, EM-DAT records of the natural disasters for the period of 30 years between 1984 and 2013 (EM-DAT, 2013) show that Asia experiences the most disaster, particularly in the southern, south-eastern, and the eastern part of the continent. The three regions have experienced nearly 3400 disaster events with a total of more than US$ 1,084 billion worth of damage, killing more than 1.1 million people. (EM-DAT, 2013).

In the developing world, one of the biggest disasters caused by the earthquake and tsunami ever recorded in terms of damage and the number of affected people is the Boxing Day tsunami in Indonesia on December 26th 2004. As a result, Subekti (2009) highlights that more than 900 national organisations from 55 countries were involved in the reconstruction of the tsunami affected areas in Aceh. Additionally, as much as US$ 7.2 billion of pledges were made for the Aceh reconstruction. The earthquake and the tsunami caused the road infrastructure sector to suffer the most damages and losses after the housing sector (Bappenas, 2005). More than 3600km of roads were rehabilitated and reconstructed during the post-disaster reconstruction period, which raised a concern over the maintenance of the reconstruction assets. Due to the aforementioned overwhelming impacts of the disaster, as well as the extensive road reconstruction activities which took place during the post-tsunami reconstruction period, this study is accordingly focused on the reconstruction of the tsunami in Aceh, Indonesia. To provide a thorough understanding on the study area, the next section will elaborate the context of Indonesia.

2.5 The Indonesian context

2.5.1 Disasters in Indonesia

The Republic of Indonesia is an archipelagic country located in the Southeast Asia. Its geographical condition and location make Indonesia one of the most disaster-prone countries. Two of the largest volcanic eruptions ever recorded, Tambora Mount in 1815 and Krakatau Mount in 1883, took place in Indonesia. On December 26th in 2004, earthquake and tsunami killed more than 167,000 people and caused economic losses of more than Rp 48 trillion.

In addition to volcanic eruptions, earthquakes, and the subsequent tsunamis, Indonesia is also prone to other types of man-made and natural disasters. According to the National Disaster Management Agency - *Badan Nasional Penanggulangan Bencana* (BNPB, 2010), the list of disasters in Indonesia includes landslides, floods, droughts, wildfires, erosions, fires, extreme wave and abrasion, extreme weather, technological failures, epidemiological and social conflicts.

In Indonesia, within the 30-year period from 1983 to 2012, EM-DAT (2012) recorded that the top 10 natural disasters causing the greatest losses and damages have been seismic activities (earthquake and tsunami), floods and wildfire. In total, these disasters caused damages worth more than US$21.5 billion. In terms of economic losses, five of the ten worst natural disasters within that period have been earthquake events (including the subsequent tsunami) which accounted for almost 50% of the total losses and damage.

Not only have earthquakes caused the greatest damages and losses, they have also caused the greatest number of fatalities. Six out of ten worst natural disasters in Indonesia have been earthquake events, which were responsible for almost more than 98% of the total casualties of 179,677 people. More detail information on the top 10 natural disasters is presented in Table 2.6 and Table 2.7.

As shown in Table 2.6, the scale of damages caused by the major earthquakes are, in many cases, overwhelming. On December 26th, 2004, an earthquake measuring 8.9 on the Richter Scale (Bappenas, 2005), and followed by tsunami waves, hit 12 nations along the Indian Pacific Ocean. Among the 12 nations affected, the province of Aceh in Indonesia suffered the greatest level of damages and losses. According to the Bappenas (2005) the earthquake and subsequent tsunami, which also affected a number of the neighbouring countries, including Thailand, Sri Lanka, Maldives, Bangladesh, Myanmar and Somalia, caused the death of more than 126,000 people, resulted in more than 93,000 missing persons and lead to more than half a million of IDPs in Indonesia alone.

Table 2.6 – Top 10 natural disasters in Indonesia (total damages) 1983-2012

Disaster Events		*Damages (000 US$)*
Earthquake (seismic activity) ***Total 10,451,600***	***29/11/1998***	***200,000***
	26/12/2004	***4,451,600***
	27/05/2006	***3,100,000***
	12/09/2007	***500,000***
	30/09/2009	***2,200,000***
Wildfire ***Total 9,300,000***	***Sep 1997***	***8,000,000***
	Mar 1998	***1,300,000***
Flood ***Total 1,755,800***	***09/02/1996***	***434,800***
	27/01/2002	***350,000***
	31/01/2007	***971,000***
Total		*21,507,400*

Source: EM-DAT (2012)

Table 2.7 – Top 10 natural disasters in Indonesia (total number of fatalities) 1983 – 2012

Disaster Events		*Fatalities*
Earthquake (seismic activity) ***Total 176,898***	***12/12/1992***	***2,500***
	26/12/2004	***165,708***
	28/03/2005	***915***
	27/05/2006	***5,778***
	17/07/2006	***802***
	30/09/2009	***1,195***
Epidemic ***Total 2,107***	***Jan 1998***	***672***
	May 1998	***777***
	Jan 2004	***658***
Drought	***Sep 1997***	***672***
Total		*179,677*

Source: EM-DAT (2012)

Three months later on March 28th 2005, an earthquake measuring 8.2 on the Richter Scale devastated Nias Island in the Northern Sumatra and resulted in 900 casualties and 40,000 displaced persons (BRR and Partners, 2006). Despite the difference in the number of victims and losses between the two earthquakes, they were both highly destructive. As illustrated in

the 'Aceh And Nias One Year After The Tsunami' report (BRR and International Partners, 2005), the boxing day earthquake caused the Simeulue Island (the island nearest to the earthquake epicentre) to sink for about one meter. However, the following Nias earthquake caused it to rise more than two meters above the sea level, exposing the coral reefs which were once submerged under the seawater. To rebuild these regions it was estimated that approximately US$ 4.9 billion was required (BRR and Partners, 2006). From the infrastructure point of view, the Ministry of National Development Planning - Bappenas (2005) describes that among other development sectors, including; social, infrastructure, production, economic and governance, the 2004 earthquake and tsunami in Aceh which was soon followed by the Nias earthquake in March 2005 had resulted in the infrastructure sector suffering almost 20% of the total estimated losses and damages. More details of the total losses and damages are presented previously in Table 2.3, section 2.3.2.

The Indian Ocean tsunami and the subsequent earthquakes in March 2005 are probably the most significant disasters in terms of disaster management initiatives in Indonesia. The extensive level of losses and damages, the number of fatalities and the intense level of attention by the media and international organisations has alerted the national consciousness to the importance of disaster management in Indonesia. Additionally, the tsunami reconstruction blueprint (Bappenas, 2005) denotes that the needs for rehabilitation and reconstruction of road infrastructure in Aceh and Nias were more than Rp 6 trillion, as the post-disaster reconstruction would need to replace the damaged infrastructure beyond their original condition (please refer to section 2.2.3.2 regarding "Post-disaster reconstruction fund").

Furthermore, the level of destruction caused by the disaster was so immense that the government of Indonesia immediately pronounced it as a national disaster (Bappenas, 2005). According to Law no. 24/ 2007 (2007), indicators for determining the status of a disaster include the number of victims, the amount of financial losses, the level of damages of infrastructure facilities, the affected geographical area as well as the level of the socioeconomic impacts. Also, the consequent impact was far beyond the local and provincial governments' capacity to cope with their own resources. As a result, the national government immediately appointed the national disaster management agency to act as the overall emergency response coordinator and established a special agency for the reconstruction and rehabilitation in Aceh and Nias.

Accordingly, the roles and responsibilities of these agencies will be discussed in the following section.

2.5.2 Disaster Management Agency

2.5.2.1 Badan Nasional Penanggulangan Bencana – BNPB

Indonesia has established a special agency responsible for the coordination and the implementation of the disaster management and post-disaster reconstruction activities. This disaster management agency was established initially in 1945 as an agency responsible for providing aids to post-war victims and their families. Over time, this agency experienced several changes in name, roles and responsibilities, which eventually also accommodated the man-made and natural disasters. Since 2008, this agency has been further developed into disaster management agency with wider scope of work and changed its name to *Badan Nasional Penanggulangan Bencana* - BNPB (National Agency for Disaster Management). The history of the agency development is presented in Figure 2.11. Among others, the main functions of BNPB are to provide guidance and direction regarding disaster mitigation, emergency, rehabilitation and reconstruction activities; develop standards for disaster mitigation efforts, disseminate disaster reduction activities to the public, as well as to produce manual for the development of disaster management agency at the regional level (BNPB, 2012).

With regards to the reconstruction of tsunami disaster in Aceh, the government of Indonesia established a special agency for the reconstruction of the affected areas. The agency is called Badan Rehabilitasi dan Rekonstruksi Aceh Nias, also known as the BRR, which will be described in the following section.

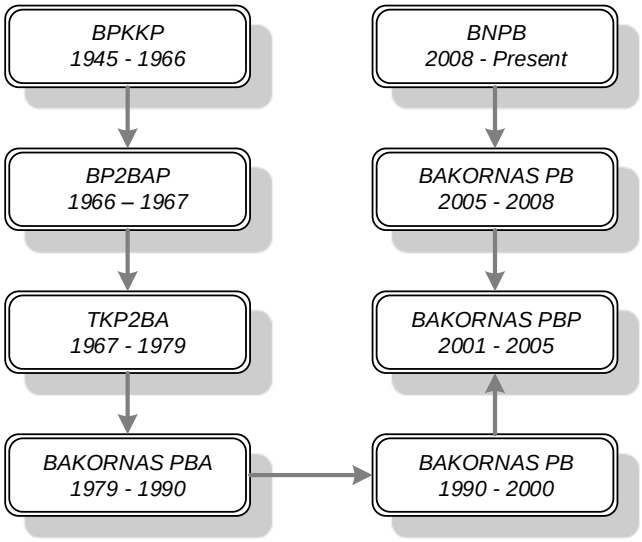


Figure 2.11 – History of Disaster Management Agency in Indonesia

Source: BNPB (2012)

2.5.2.2 Badan Rehabilitasi Dan Rekonstruksi Aceh-Nias

As previously described, the level of destruction caused by the 2004 tsunami and the subsequent earthquake in 2005 was devastating. Consequently, the scale of rehabilitation and reconstruction activities required to restore the affected area was so overwhelming that it was beyond the capacity of the regional government to cope with the impacts and even beyond the scope of the existing national disaster management agency in 2004; Bakornas PBP (National Coordinating Agency for Natural Disaster and Refugees Relief). As a response, the Government of Indonesia initiated a master plan and issued a regulation in lieu of law (PERPU) no 2/2005 (2005) for the establishment of the special agency, *Badan Rehabilitasi Dan Rekonstruksi Aceh Nias* - BRR (The Rehabilitation and Reconstruction Agency for Aceh and Nias). This agency was responsible for the implementation and the coordination of all rehabilitation and reconstruction activities in Aceh and Nias Island. Its specific mandate was to “design policies, strategies and action plans, within an atmosphere of transparency and accountability, and to implement them through effective leadership and coordination of the combined domestic and international effort to rebuild Aceh and Nias back better and safer"(Sugiarto, 2009).

In order to reduce bureaucracy and accelerate the pace of reconstruction, as well as to provide a prompt response to the reconstruction needs, BRR was established at a ministerial level of authority and was headquartered in Banda Aceh; which was the centre of the disaster and

reconstruction activity. In the implementation process, BRR involved a number of local government agencies and also included their representatives in the BRR organisational structure. In accordance with the PERPU no 2/2005, BRR was dismissed in 2009, four years after its mandate was instituted in 2005. The responsibility for the coordination and implementation of incomplete reconstruction projects was then transferred to the respective ministries.

Along with the termination of the BRR and the transfer of incomplete projects to the respective ministries, the reconstruction assets were also handed over to the respective (provincial or local) governments, which were expected to be responsible for the long-term operation and maintenance of the assets. However, the reconstruction of road infrastructure raised two main concerns. The first concern was whether the development opportunity 'offered' by the tsunami disaster had been used to improve the road infrastructure in line with the build back better principle. The second is related to the sustainability of the road reconstruction assets, with the particular focus addressed on the role and the capacity of the local government to maintain the assets. These two issues are highlighted as the main concerns of the reconstruction of road infrastructure in the disaster context, which lead to the formulation of the aim of this study, "to evaluate the capacity of the local governments in the maintenance of the road infrastructure assets within the context of the post-disaster reconstruction process" (for more detail, please refer to section 3.2.4 regarding the process of research problem identification and section 3.2.5 regarding the research aim and objectives).

Whilst the above sections have provided an overview of disasters in Indonesia and the agencies responsible for disaster management, there is a need to synthesise what the reconstruction of road infrastructure means in a post-disaster setting. However, prior to discussing the road infrastructure in Indonesia, the next section will elaborate the Indonesian government system, as it will provide a broad picture on how the road infrastructure in Indonesia is managed.

2.5.3 Indonesian government system

The government system in Indonesia has experienced a number of changes. The most relevant change which impacts are essential to this research is probably the change from a centralised to a decentralised system which began in 1999 by the issuance of two Laws; Law no 22/1999

regarding Regional Governance and Law no 25/1999 regarding the fiscal balance between the national and the regional governments.

In the Indonesian laws and regulations, the subnational governments; which consist of the provincial and the local government, are often referred to in the same terms; regional governments (*Pemerintah Daerah).* This is particularly true when the subject being discussed is relevant to both the provincial and the local governments. Accordingly, in this report, the term of *"regional government"* will be used when the subject being discussed is relevant to both the provincial and the local governments. Otherwise, provincial government and/or local government (district and cities) will be addressed specifically. The government system of Indonesia will be discussed in more detail in the following sections.

2.5.3.1 Structural hierarchy

The structure of the Indonesian government and their functions are explained in the Law no 32/2004 (Law, 2004a). Administratively, Indonesia is divided into a number of provinces, and the provinces are further subdivided into districts and cities. Furthermore, districts and cities are divided into *Kelurahan* and/or villages. The following Figure 2.12 illustrates the structural hierarchy of the Indonesian government.

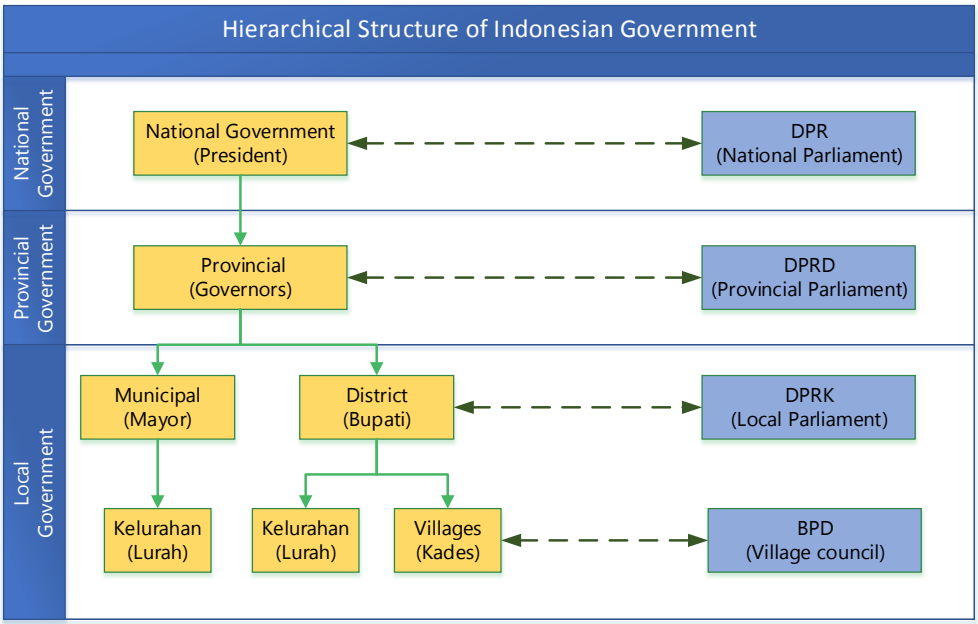


Figure 2.12 – Hierarchical Structure of Indonesian Governments

Source: Law (2004a)

At the local level, there are two types of government, district and cities. A district is governed by a Regent or locally called as *Bupati*, and a city is governed by a Mayor. The main differences between districts and cities are that a district is governed by a *Bupati*, has a relatively wider area, and consists of several sub-district (*kelurahan*) and villages. One of the (bigger) sub-districts is selected as the capital 'city' of the district. A city, on the other hand, is governed by a Mayor, consists of several and relatively smaller sub-districts and *kelurahan.* Unlike a district, a city does not have villages on its structure.

Furthermore, the decentralisation process in Indonesia allows for the establishment of new regions as well as the unification of several geographically connected regions. Accordingly, many local governments in Indonesia were part of a larger district which then developed and formed a separate local government. More discussion on the issue of decentralisation in Indonesia will be presented in the following section.

2.5.3.2 Decentralisation in Indonesia

Decentralisation in Indonesia was initiated in 1974 with the issuance of Law no 5/1974. However, it was not until 1999, following the collapse of the Suharto regime, that the fiscal and administrative decentralisation was changed and radically applied. The decentralisation emerged as a result of the failure of the national government during the centralised system era in responding and providing solutions to the needs and the unique problems that each region faced. The rationale behind decentralisation relates to the responsiveness and accountability resulting from the closer proximity between the government and citizens (Devas, 1997). Additionally, Rasyid (2004) argues that the previous centralised system mainly concentrated on dealing with domestic and local affairs and thus failed to adequately observe, learn and understand the global financial and economic trends which eventually led to the 1997 financial crises in Indonesia.

In 1999, two laws were issued in response to the demand and pressure for decentralisation from the regional governments. The two laws become the basic foundation of the decentralisation system in Indonesia and replaced Law no 5/1974 regarding the Governance Principles in the Regions. The two laws are:

- Law no. 22/1999, which was later replaced by Law no. 33/2004, is related to the Regional Governments and stipulates the political and administrative authority and responsibility of the national, provincial, district and city governments in the decentralised structure.
- Law no. 25/ 1999, which was later replaced by Law no. 34/ 2004, is related to the fiscal balance between the National Government and the Regional Government, providing the legal foundation for fiscal decentralisation, which also outlines the new income resources and financial share between the national and regional governments.

In the decentralisation era, the government system is carried out based on three principles; decentralisation, co-administration and deconcentration. According to Law no. 32/2004 (2004a), decentralisation is defined as the transfer of authority from the national government to the regional governments. Co-administration is defined as the devolution of areas of responsibility from the national government to the regional governments. Deconcentration is defined as the distribution or delegation of authority from the central government to the governor or to regional officers as the representatives of the national government.

Following the decentralisation of the government system in Indonesia, a significant extent of authority and responsibility were also transferred from the central government to the regional governments. Accordingly, the regional governments are now responsible for the management of their own expenditure and resources, which are originated locally or received through the fiscal balance mechanism and as deconcentration funds allocated by the national government.

Within the road infrastructure context, the transferred responsibilities include the provision and allocation of funds for the development and the maintenance of the road infrastructure. More than 80% of the road networks are district roads, which are under the responsibility of the local government. As a result, the overall condition of the road networks in Indonesia is highly dependent on the capacity of the local government in managing the road networks. Whilst a proportion of the financial needs to manage the district road networks are provided by the national government through the *Dana Alokasi Umum* – DAU (Block Grant Fund), the local governments are held responsible for the financial management of the majority of the road networks.

However, the financial management capacity of the local governments in Aceh is considerably poor. A World Bank survey on Aceh's Public Financial Management (PFM) capacity (2007) concluded that the average score of the local governments' PFM capacity is 41%, which ranges from good (69%) to very poor (15%). The survey also concluded that among the nine key areas of financial management, all local governments perform poorly in at least one strategic area. The nine key areas are (1) regulatory framework; (2) planning and budgeting; (3) cash management; (4) procurement; (5) accounting and reporting; (6) internal audit; (7) public debt and investment; (8) asset management; and (9) external audit and oversight (World Bank, 2007).

2.5.3.3 Fiscal Balance

In the centralised system, both the provincial and the local governments acted as the representatives of the national government. The national government delegated tasks, at the regional level, to the regional government and accordingly provided the funds required to perform such tasks. In the decentralised system, most of the tasks are now the responsibility of the local governments. Unlike the centralised system, where regional government performed certain tasks assigned to them by the national government, in the decentralised system, the regional governments create and implement their own policies and fund their own programmes. Accordingly, the national government transfers the financial resources to the regional governments under the fiscal balance and revenue sharing mechanism. In addition to the general fiscal balance and revenue sharing mechanism, Aceh province holds a special autonomy status, which gives Aceh additional budget allocation from the oil and gas revenue sharing and the special autonomy funds. More discussion regarding the special autonomy status of Aceh province will be presented in section 2.5.6.

2.5.4 Road infrastructure in the Indonesian context

Indonesia has a population of more than 237 million people (BPS, 2010a). Of all transportation modes, road transportation predominates the movement of goods and people. Annually, around 99% of the 3.8 billion passenger travels and 97% of the 2.4 billion tonnes of goods movements are delivered by land transport. Particularly in Java and Sumatra Island, the proportion of road transport is as high as 80-90% of the total movements (DoT, 2005a).

Additionally, the rate of the road vehicle growth is also high. According to BPS (2010b) between 2004 and 2009, the number of vehicles grew from 23 million vehicles in 2004 to more than 52 million vehicles by 2009, a growth of greater than 220% (see Table 2.8). This indicates the increasing needs and dependencies towards the road infrastructures in Indonesia.

Whilst the need for good and reliable road infrastructure is high, the road infrastructure condition is not satisfactory. By 2006, less than 32% of the 34628.8 km national road networks were in good condition. The remaining networks were either in moderate condition (50%), lightly damaged (9.3%) or severely damaged (9.1%) (Bina Marga, 2010).

Table 2.8 – Vehicle Growth in Indonesia

Year	*Car*	*Bus*	*Truck*	*Motorcycle*
2004	***4,464,281***	***933,199***	***2,315,779***	***23,055,834***
2005	***5,494,034***	***1,184,918***	***2,920,828***	***28,556,498***
2006	***6,615,104***	***1,511,129***	***3,541,800***	***33,413,222***
2007	***8,864,961***	***2,103,423***	***4,845,937***	***41,955,128***
2008	***9,859,926***	***2,583,170***	***5,146,674***	***47,683,681***
2009	***10,364,125***	***2,729,572***	***5,187,740***	***52,433,132***
Grand Total	*49,547,659*	*11,843,490*	*26,005,780*	*247,073,871*

Source: BPS (2010b)

Table 2.9 – Condition of National Road in Indonesia 2006-2008

No	*Condition*	*2006*		*2007*		*2008*	
		km	***%***	***km***	***%***	***km***	***%***
1	***Good***	***10956.6***	***31.6%***	***11905.4***	***34.4%***	***17200.9***	***49.7%***
2	***Moderate***	***17314.3***	***50.0%***	***16565.7***	***47.8%***	***11620.1***	***33.6%***
3	***Lightly Damaged***	***3210.1***	***9.3%***	***3232.7***	***9.3%***	***4617.9***	***13.3%***
4	***Heavily Damaged***	***3147.8***	***9.1%***	***2925.0***	***8.4%***	***1189.9***	***3.4%***
	Total	*34628.8*	*100%*	*34628.8*	*100%*	*34628.8*	*100%*

Source: Bina Marga (2010)

As shown in Table 2.9, the national road condition improved substantially in 2008. As explained by Bina Marga (2010) such an improvement of road condition was resulting from the launch of road capacity expansion projects by the national government, rather than from road maintenance initiatives.

At the local level, the condition of the road infrastructure is poor. In the period of three years between 2006 and 2008, more than 50% of the road infrastructure were damaged (more details are presented in Table 2.10).

Table 2.10 – Condition of District and City Roads in Indonesia : (Bina Marga, 2010)

No	*Condition*	*2006*		*2007*		*2008*	
		km	***%***	***km***	***%***	***km***	***%***
1	***Good***	***69,050.8***	***24.35%***	***68,727.7***	***24.26%***	***69,948.8***	***24.27%***
2	***Moderate***	***69,921.1***	***24.65%***	***71,106.7***	***25.10%***	***72,330.5***	***25.10%***
3	***Lightly Damaged***	***96,019.3***	***33.86%***	***90,799.7***	***32.05%***	***88,462.1***	***30.70%***
4	***Heavily Damaged***	***48,620.4***	***17.14%***	***52,687.9***	***18.60%***	***57,444.0***	***19.93%***
	Total	*283,611.6*	*100%*	*283,322.0*	*100%*	*288,185.4*	*100%*

In the next section, the classification of the road in Indonesia is presented based on the ownership and characteristic of the road network.

2.5.4.1 Classification of roads

Road networks can be classified into several categories according to the ownership and road characteristic. According to law no 22/2009, the latter category includes the function of the road and traffic intensity as well as the axle-load bearing capacity.

2.5.4.1.1 Classification of roads based on the road characteristics

Based on the characteristic, the Law no 22/2009 classifies road into class I, class II, class III and special road. The classification is determined by the owner of the roads (national, provincial or local government) and is marked by the provision of road sign.

Class I roads are the arterial or collector road which can accommodate vehicles with maximum 2.5m of width, 18m of length and 4.2m of height and 10 tonnes of axle weight. Class II roads are arterial, collector, local or neighbourhood road, which can accommodate vehicles with maximum 2.5m of width, 12m of length and 4.2m of height and 8 tonnes of axle weight. Class III roads are arterial, collector, local and neighbourhood, which can accommodate vehicles with maximum 2.1m of width, 9m of length and 3.5m of height and 8 tonnes of axle weight. In

certain condition, the maximum axle weight can be reduced to less than eight tonnes. The special roads are arterial road, which can accommodate vehicles with maximum 2.5m of width, 18m of length and 4.2m of height and 10 tonnes of axle weight.

2.5.4.1.2 Classification of roads based on road ownership

Law no 22/2009 and Government Regulation no 34/2006 stipulates that based on the road ownership, road networks are divided into two categories; private roads and public roads. Whilst private roads are road networks owned by private entities, public road can be further subdivided into five categories; national road, provincial road, district roads, city roads and village road.

The national roads are road networks which are under the responsibility of the national government. The road networks that fall into this category are primary arterial roads, primary collector roads which connect the provincial capitals, toll roads, and the national strategic roads. Similarly, the provincial government are road networks under the responsibility of the provincial government. Road networks of this category are primary collector roads which connect the provincial capitals with district capitals/ cities, primary collector roads which connect district capitals/cities, and the provincial strategic road.

The district roads include primary collector roads which are not covered by the provincial and national requirements as described above, primary local roads which connect the district capital with the sub-district capitals, district capital with the village centres, sub district capitals with other sub district capitals, sub district capitals with the village, and roads which connect the villages. Also included here are secondary roads which are not included as the provincial road as well as the district strategic roads. Accordingly, the management of district roads is under the responsibility of district governments.

Furthermore, city roads are the secondary road networks within a city. The village roads are primary neighbourhood and primary local roads which are not included as the district road which connects areas or settlements within a village.

2.5.5 Road infrastructure in the Aceh province context

In section 2.5.4, the overall condition of road infrastructure in Indonesia at the national context has been discussed. At the provincial and local level, however, the road infrastructure condition is considerably poorer. In Aceh Province, in 2004 only 17.8% of road networks were in good condition; around 60% were in fair condition and more than 22% were in poor condition (see Table 2.11).

Table 2.11 – Road network condition in Aceh Province, 2004 (World Bank and BRR, 2006a)

Types of road	*Good Condition*		*Fair Condition*		*Poor Condition*		*Total Length*	
	Km	***%***	***Km***	***%***	***Km***	***%***	***Km***	***%***
National	***127***	***7.4***	***1,052***	***61.3***	***538***	***31.3***	***1,716***	***9.21***
Prov.	***199***	***12.6***	***646***	***41.1***	***727***	***46.2***	***1,571***	***8.44***
Districts/ Cities	***2,995***	***19.5***	***9,410***	***61.3***	***2,995***	***19.5***	***15,339***	***82.35***
Total	*3,320*	*17.8*	*11,108*	*59.4*	*4,259*	*22.8*	*18,627.3*	*100*

Table 2.11 indicates that as the road networks deteriorate over time, the biggest concern lies in the roads with fair condition, as they may soon deteriorate to the poor condition, unless proper maintenance is provided.

In the road sector, decentralisation is translated as the distribution or transfer of authority and responsibility to manage the road infrastructure assets. As a result, the national government is responsible for the national roads; the provincial government is responsible for provincial roads, and the local governments are responsible for the district/city roads - which also include the road networks at the sub-district and the village level.

In the Aceh context, this means that the regional governments are responsible for the development and the maintenance of more than 90% of the road networks; which is more than 18,000 km in total. Around 80% of these networks are managed by the local governments, increasing the road infrastructure management dependency towards the local government capacities. Several issues have been identified with regard to the poor road conditions and the

road maintenance in Aceh. Some of the major issues will be discussed in more detail in the following section.

2.5.5.1 Road maintenance issues in Aceh

From the global experience, the main problems in the maintenance of the road infrastructure are rooted to the institutional and financial issues, with some references to the technical, organisation and human-resource issues (Heggie, 1994). More structurally, Robinson et al., (1998) classify factors affecting the performance of the road management agency into two broad categories, internal and external, relative to the road management agency (section 2.4.5). The technical factor is defined as the organisation's capability to undertake the physical or engineering task, consisting of the availability and use of data and resources, technical capability, as well as access to research and information. The institutional factors include financial and resource management, organisational issue and human resource. On the other hand, the external factors include physical environment, legal and regulatory framework, socio-cultural background of the country, the political situation, macro economy and the national resources availability, overall government employment policies, and the relationship with other institutions.

Even though these affecting factors are divided into different categories, they are not mutually exclusive and in fact related to each other. For instance, the availability and use of data may be affected by the availability and sufficiency of fund allocation, which is basically resulting from the political interference and macro-economic condition. Additionally, despite the rapidly deteriorating road infrastructure due to the maintenance neglect, developing countries tend to expand their road infrastructure without giving adequate priority to maintaining the existing networks (UNECA, 1987). As Klockow and Hofer (1991) suggest, road maintenance neglect may lead to increased vehicle cost, severe damages requiring re-construction of road, unbearable financial needs, and the accelerated deterioration due to the heavier and more frequent traffic. The discussion will accordingly progress to the issues in road maintenance within the context of the Aceh province.

2.5.5.1.1 Gradual decrease of the Operational & Maintenance budget for public service

In order to improve the road condition and help ensure the sustainability of the road infrastructure, the Indonesian government has initiated the establishment of a road fund agency as stipulated in Law no 22/2009. However, the road fund agency has not been functioning and its supporting mechanism and regulations have not been clearly defined. Until the road fund agency starts functioning, it seems that road maintenance will continue relying on fund sourced from the general expenditure and the normal budgetary system.

Furthermore, the decentralisation system and Aceh's special autonomy status have resulted in a significant increase in the annual budget expenditures. This is mainly due to transferred responsibilities from the central government to the local government as well as additional income sourced from the special autonomy fund and the oil and gas revenue sharing. In contrast, however, the allocation for the 'operation and maintenance' of public services has gradually decreased, as shown in Table 2.12 (World Bank and BRR, 2006a).

Table 2.12 – Composition of Aceh Public Expenditure 2003 – 2005

Expenditures	*2003*		*2004*		*2005*	
	Prov.	***Districts***	***Prov.***	***Districts***	***Prov.***	***Districts***
Apparatus Expense	***34.7%***	***34.9%***	***37.2%***	***38.5%***	***40.9%***	***39.8%***
Capital	***5.4%***	***4.1%***	***4.9%***	***4.3%***	***7.1%***	***4.8%***
General Administration	***22.7%***	***26.1%***	***23.4%***	***28.2%***	***24.2%***	***31.1%***
Operation and maintenance	***6.5%***	***4.6%***	***8.9%***	***6.1%***	***9.5%***	***4.0%***
Public Expense	***65.0%***	***55.6%***	***62.6%***	***51.8%***	***58.2%***	***50.9%***
Capital	***28.9%***	***16.6%***	***28.1%***	***15.2%***	***24.5%***	***18.6%***
General Administration	***2.1%***	***22.5%***	***1.3%***	***22.5%***	***0.9%***	***18.2%***
Operation and maintenance	***34.1%***	***16.5%***	***33.2%***	***14.1%***	***32.9%***	***14.1%***
Unexpected Expenses	***0.3%***	***2.3%***	***0.2%***	***2.1%***	***0.9%***	***1.6%***
Financial Ass. & Sharing Exp.	***0.0%***	***7.3%***	***0.0%***	***7.6%***	***0.0%***	***7.7%***
Total	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*

Source: Adapted from World Bank and BRR (2006a)

The proportion of budget allocation for the Operation and maintenance (O&M) of public expenses between 2003 and 2005 is higher at the Provincial level (at about 32-34%). Whereby,

for the same period, the district governments in average allocated less than half of the Provincial O&M allocation; at only 14-16% of its total annual budget. A large proportion of the annual budget was allocated for the general administration expenditure. The allocation was shared to all public facilities and put a significantly higher threat to the road infrastructure in Aceh.

One of the causes of poor road maintenance allocation was argued to be rooted in the inadequate capacity of the local governments in financial management. A study about the Aceh regional governments' Public Financial Management capacity was conducted by the World Bank and BRR (2006a), which will be discussed in the next paragraphs.

2.5.5.1.2 Poor public financial management capacity

The fund for the road maintenance needs in Aceh is currently sourced from the general budget expenditure which follows the normal budgeting process. In this approach, the allocation of fund for the road maintenance will need to compete directly with other sectors. Unfortunately, it has been widely recognised that the decision-making process in the developing countries is often delivered subjectively due to the political pressure rather than economic consideration (ADB, 2003).

Unfortunately, the regional governments' PFM is considerably low. According to the report of Public Financial Management in Aceh (World Bank, 2007), the low PFM capacity was due to the rapid decentralization process which transferred the fiscal responsibilities and financial resources to the local governments, and that the process was not followed by increased capacity of the local government to manage these resources. This condition is worsened by the significant rise to the number of new districts in Aceh (from 10 districts in 2000 to 21 districts by 2011) as well as by the impacts of the prolonged conflict and the tsunami.

As presented in Figure 2.13, the score of most of the districts in the West Coast area (Aceh Selatan, Aceh Barat, Nagan Raya, Aceh Barat Daya and Aceh Jaya) are below the average district score. Since the tsunami hit most of the West Coast areas, the majority of road infrastructures in these districts have accordingly been reconstructed relatively rapidly during the post-disaster reconstruction period. Consequently, concerns over the maintenance of the reconstructed road infrastructures in these areas are therefore higher.

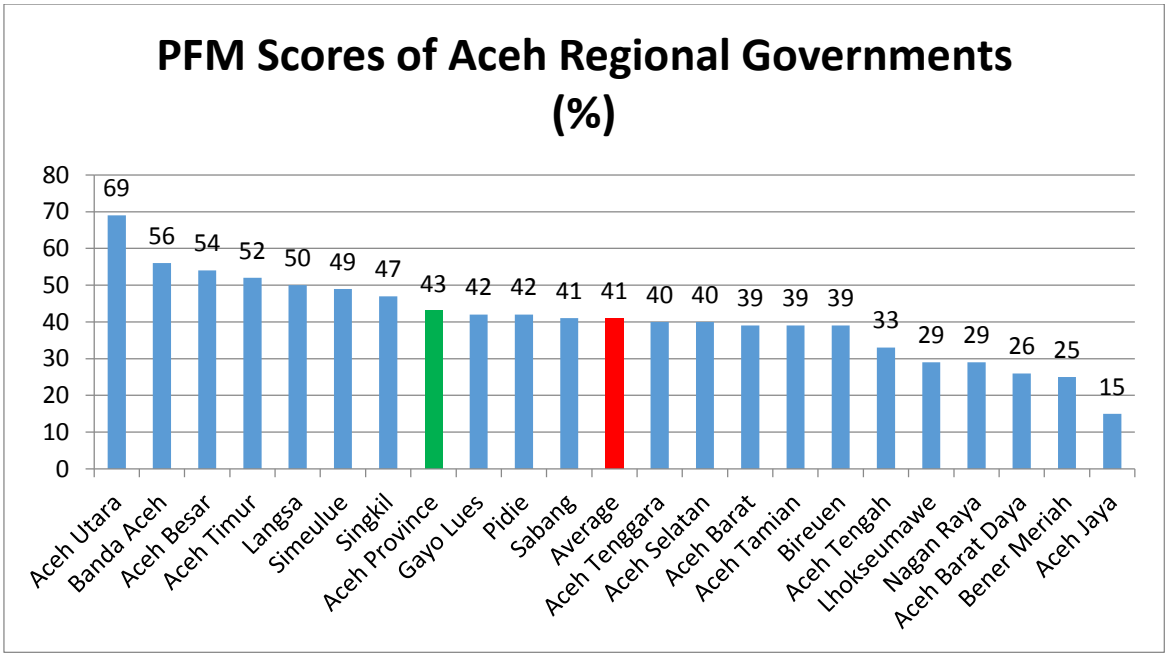


Figure 2.13 – PFM Scores of 21 districts in Aceh

Source: World Bank and BRR (2006a)

2.5.5.1.3 Delays in budget approval

Another concern related to the PFM capacity and the road maintenance is in regard to delays in the annual budget approval. The financial year in Indonesia starts on January 1st and ends on December 31st. According to the Regulation of Ministry of Home Affairs (MoHA) no 59/2007, the draft of the annual budget proposal needs to be submitted by the Governor to the parliament for approval at the latest by the first week of October. The parliament, accordingly, need to approve the budget proposal at the latest 1 month prior to the start of the financial year, i.e., 1st of December. However, approvals of the annual budget proposal have always been delayed. The dates of approval of the provincial and the case study district governments' annual budget are presented in Table 2.13.

As shown in the table, the delays in the budget approval can be as late as June of the running financial year. Such delays occurred due to both the overdue submission of the budget proposal by the governor and the late approval by the local parliament. Because of the delays, the national government issued a penalty of 25% cut of the Aceh's DAU (block grant) in 2011, which was worth as much as Rp 178 billion (US$ 17 million) (Fik, 2011).

Table 2.13 – Budget Approval date of the Aceh Province

Financial Year	*Date of Budget Approval*
2006	***March 5th 2006***
2007	***May 20th 2007***
2008	***June 24th 2008***
2009	***January 29th 2009***
2010	***March 19th 2010***
2011	***April 15th 2011***
2012	***February 10th 2012***

Additionally, delays in the budget approval would also mean that the remaining time to spend the allocated budget is automatically reduced as the budget will need to be expended by the 31st of December. If the government could not expend their entire budget allocation, the allocation for the following year might be consequently adjusted to reflect the actual fund expending capacity.

2.5.6 Special autonomy status of Aceh

The decentralisation process in Indonesia resulted in the establishment of autonomous regions where most of the technical and financial responsibilities are transferred from central government to the regional government. Accordingly, most of the funds and budget allocation that were previously managed by the central government in the centralised system have now been transferred to the regional governments.

Aceh Province, however, has a special autonomy status from the central government. In 1999, Aceh was given a special region status which gives it greater authority with regard to religious, customary and educational matters, as well as in the role of *Ulama* (Moslem clerics) in the decision-making processes (Law, 1999). In 2001, the special regional status of Aceh Province was followed by the provision of special autonomy status through Law no. 18/2001. The special status provides Aceh's annual budget with a greater amount of fiscal balance and additional revenue sharing from oil and gas production.

2.5.6.1 Aceh Special Fund

Due to the special autonomy status that was given in 2001 (Law, 2001), Aceh receives two additional sources of income namely; additional revenue sharing of oil and gas (*Dana Tambahan Migas*) and special autonomy fund (hereafter called as OTSUS fund). These funds were assigned to Aceh for a 20-year period, starting from 2008.

2.5.6.1.1 Additional Revenue Sharing for Oil and Gas

According to Law no 33/2004 (Law, 2004b), the regional governments in Indonesia receive a proportion of revenue generated from the oil and gas production. The proportion of revenue sharing received by the regional governments is 15.5% of the net oil production revenues and 30.5% of the net gas production revenues produced in the respective regions. However, due to the special autonomy status, Aceh also receives an additional amount of revenue sharing from oil and gas production, in addition to the regular revenue sharing mentioned above. The proportion of the additional revenue sharing varies over a designated period.

Based on the Law no 18/2001 (Law, 2001), the proportion of additional revenue sharing for oil and gas received by Aceh province is as follows:

1. 55% for oil and 40% for gas, for eight years until 2009.
2. 35% for oil and 20% for gas (2009 onwards)

This allocation is given to the regional governments of Aceh, which includes the provincial and local governments. Distribution of the additional revenue sharing between provincial and local governments is stipulated in Clause 5 of Qanun no 2/2008 and is summarized in Table 2.14.

Table 2.14 – Distribution of Additional Revenue Sharing of Oil and Gas

No	*Receiver*	*Allocation*	*Remarks*
1	***Provincial Government***	***40%***	
2	***Producing districts***	***25%***	***Districts that produce oil/ gas***
3	***Non-Producing districts***	***35%***	***50% is equally distributed to all districts and 50% is shared proportionately according to the set of indicators***
	Total	***100%***	

Source: Qanun Propinsi NAD (2008)

According to Qanun no 2/2008 (2008), a minimum of 30% of the total fund must be allocated to the education sector. Accordingly, use of the fund for other development programs and activities may not exceed 70%. However, even though the fund is distributed to all districts in Aceh, it is not given in the form of budget transfer, but in the form of budget allocation to fund the approved projects and activities previously requested by the relevant districts. The projects and activities are also carried by the provincial government for the districts, and hence the fund is included in the provincial budget, APBA.

2.5.6.1.2 Special Autonomy Fund (OTSUS fund)

OTSUS fund is fund allocation included in the national budget APBN instead of the provincial budget APBA or the district budget APBK. However, this fund is managed by the government of Aceh Province as the representative of the national government at the regional level. The OTSUS fund is allocated to fund the development projects, particularly for the development and the maintenance of infrastructure and the economic, poverty reduction, education, social and health sectors. The Otsus fund allocation worth around Rp 3.5 trillion (~£175 million) in 2008 to Rp 6.2 trillion (~£310 million) in 2013 per annum.

Based on Qanun no 2/2008, the use of OTSUS fund is distributed as follows:

- Maximum 40% is allocated for development at Provincial level.
- Minimum 60% is allocated for development at the district level, distributed to all districts based on a formula stipulated by the governor according to the number of people, areas, GRDP, Human Development Index, Construction Expensiveness Index (IKK) and other relevant indicators.

Table 2.15 – Distribution of OTSUS fund

No	*Receiver*	*Allocation*	*Remarks*
1	***Provincial Government***	***Max 40%***	
2	***Districts governments***	***Max 60%***	***The fund is shared proportionately according to certain indicators, such as number of people, areas, GRDP, HDI and other relevant indicators.***
	Total	***100%***	

Source: Qanun Propinsi NAD (2008)

Similar to the additional revenue sharing of oil and gas production, even though the fund is distributed to all districts in Aceh, it is not given in the form of budget transfer. Instead, it is distributed in the form of a budget allocation to fund projects and activities requested by the relevant districts. The agreed projects and activities will also be carried out by the provincial government, as the representative of national government, for the districts. Hence, this fund is included in the national budget APBN and not in the regional budget APBA or APBK.

The above sections have provided the context of the Indonesian government system, as well as the current position of the disaster management and road maintenance efforts. The context of Aceh as the focus area of the study has also been discussed in detail. As the Aceh province experienced a conflict of more than 30 years prior to the peace agreement in 2005 between the Free Aceh Movement (GAM) and the Government of Indonesia (GoI), it is imperative to have an overview of the conflict in Aceh as it is argued to have affected the reconstruction and the maintenance of the road infrastructure in the province. Accordingly, the discussion progresses to the following chapters to the topic of conflict in Aceh.

2.5.7 Conflict in Aceh

The conflict in Aceh between *Gerakan Aceh Merdeka* – GAM (Aceh Free Movement) and the Government of Indonesia (GoI) was initiated by the establishment of GAM in 1976, demanding to separate from Indonesia and to form its own government. However, as Miller (2012) summarises, there were precursors of conflicts that eventually lead to the establishment of GAM. McCulloch (2006) describes that there are three factors commonly referred to as the sources of conflict in Aceh; the corrupt and 'predatory' practices of non-Acehnese in the province, the human rights abuses by those acting on behalf of Indonesian government, as well as the argument that Aceh was never legally part of Indonesia. However, Miller (2012) highlights that the conflict in Aceh was believed to have stemmed back in 1873 by the invasion of the Dutch to the State of Acheh-Sumatra, which 'illegally transferred' Aceh to the Indonesian government in 1949. The illegal transfer was confronted as the involvement of Aceh in the Indonesian struggle with the Dutch colonial government by supplying human and economic resources was completely voluntary. However, Aceh agreed to join the new Indonesian state as long as Aceh was given autonomy to uphold the Islamic principles, which lasted only for a year by the inclusion of Aceh as part of the North Sumatra province, one of the 10 provinces in

the newly reorganised administrative system in 1950. The discovery of oil and gas resource in 1971 in Aceh raised the resentment of the Acehnese as most of the profits were siphoned out of Aceh leaving little improvement to the local economy. Additionally, the sense of betrayal was worsened in 1974, when the new law no 5/1974 practically stripped off the Aceh special region principles and removed the influence of *Ulama* (Muslim clerics) in the governance. This was followed by the embedment of armed forces in Aceh to "defend national economic interests, to prevent the emergence of opposition forces, and to monitor and control those 'legitimate' political parties that had helped to elevate Suharto to power" (Miller, 2012).

The discontentment eventually grew and led to the establishment of Acheh-Sumatra National Liberation Front – ASNLF, locally known as GAM, in 4th of December 1976, "re-declaring the 'free and independent Sovereign State of Aceh-Sumatra." The conflict virtually ended in august 2005, with the signature of the peace agreement between GAM and the government of Indonesia (2005). The peace agreement was soon followed by the general election which appointed Irwandi Yusuf, a former GAM official, as the governor of Aceh for the period of 2007 – 2012. In 2012, Irwandi Yusuf lost the general election to Zaini Abdullah, who was also a former high-rank official of GAM. As an overview of the conflict in Aceh has been presented, the following section will provide a discussion on the main issues in post-conflict reconstruction as identified from the literature.

2.5.7.1 Post-conflict reconstruction

From their experience in the post-conflict reconstruction in East Timor, Rohland and Cliffe (2002) highlight several key lessons learned from different perspectives, including pre-mission planning and readiness, financial mobilisation and aid coordination, as well as reconstruction design and implementation. They suggest that in the planning period, early engagements of stakeholders, clear roles and responsibilities between institutional organisations and a "truly" joint planning between the national counterparts and donors are the key lessons learnt to successful post-conflict reconstruction. From the financial aspect, they also add that the inappropriate complexity of aid financing mechanism experienced in East Timor hindered national ownership and prevented the integration of funding sources into the national budget. Finally, the reconstruction design and implementation phase should well consider finding the right balance between building human and institutional capacity and the management of

emergency rehabilitation and services. Here, the reconstruction may need to make a trade-off between reconstruction speed and national capacity building. Additionally, "the use of community-driven approach, non-governmental and private sector capacities, as well as the prompt response to building procurement and payment systems are argued to help accelerate reconstruction and service delivery.

Additionally, Billon and Waizenegger (2007) confirm that the pre-disaster political trends have a significant impact on the post-disaster conflict outcomes and that the spatiality of conflicts and disaster as well as the post-disaster condition of governable spaces and public discourse determine the political fallouts of the tsunami in Aceh and Sri Lanka. It is also argued that the historical hostility experienced by a nation has a strong influence to the current stage of ethno-political conflict, which ultimately hinders the process of nation building. It is also argued that cultural and ethnic distinction have been enhanced, or even created, by the colonial process which exercises a divide-and-rule policy and promotes ethnic identities (Smith AD, 1979 cited in Imtiyaz and Stavis, 2008). With regards to political fallouts of disaster, they further suggest two main arguments. First, disasters may result in political changes. This is particularly due to the resulting grievances among the affected population and the more acute sense of identity, the enhanced legitimacy for the political leadership and the greater scrutiny over dominant institutions and development policies, shifting of political actors, and post-disaster spontaneous collective action. Conflict also changes the behaviour, preferences and institutional functioning resulting from the compromised security of individuals and communities (World Bank, 2009a). Second, the pre-disaster context and trends of politics largely determine the political fallouts of disasters. They believe that with regards to conflict transformation, disasters accelerate and amplify the pre-disaster social and political dynamics, rather than providing a 'new departure' as a result of the devastating impact of disasters.

Billon and Waizenegger (2007) also conclude that disaster may provide an opportunity for peace building due to changes in the value structure among survivors, the mutual needs for relief assistance, enhanced local political socialisation and mobilisation, as well as international involvement and disaster diplomacy. On the other hand, conflict can also greatly adverse the growth of political, social and economic institutions which impacts affect the economies in the

post-conflict period (World Bank, 2009a).Some of the major concerns in post-conflict reconstruction will be discussed in the following section.

2.5.7.2 Post-conflict reconstruction and development discourse

According to Anand (2005), post-conflict reconstruction is relevant to the development discourse due to three things. First, conflict increases the challenge to development, particularly since most conflicts take place in the developing countries. Second, since conflict frequently affects the poor people, it exacerbates the inequality, hence hindrance the MDG achievement. Thirdly, conflicts seem to influence aid priorities creating a 'crowding-out' effect.

Additionally, Based on their study on the post-conflict reconstruction in East Timor, Rohland and Cliffe (2002) highlight the need to link the design and implementation of reconstruction programs to the four objectives of reconstruction, which are to build technical and managerial capacity, to achieve rapid physical reconstruction, to restore service delivery, and to establish sustainable policies and institutions. Additionally, Anand (2005) also suggests to link reconstruction programs with poverty reduction- as one of the MDGs targets, effective governance and state reconstruction, as well as conflict prevention and peace.

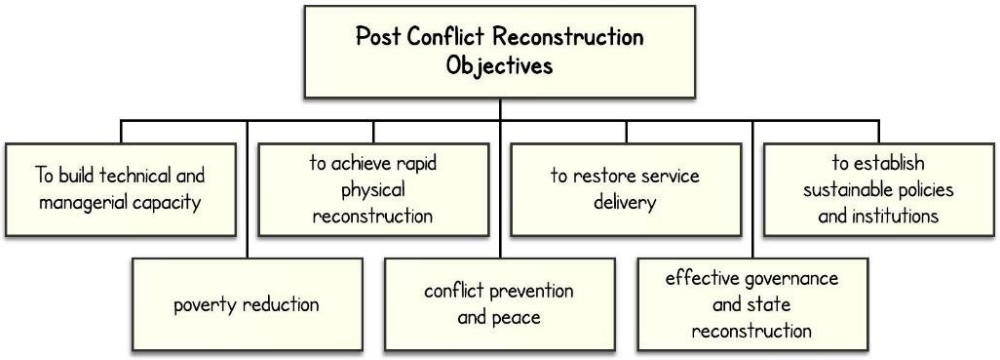


Figure 2.14 – Post-conflict reconstruction objectives

Source: Rohland and Cliffe (2002), and Anand (2005)

The post-conflict reconstruction objectives as illustrated in Figure 2.14 are by no means exhaustive and are open for discussion. However, they provide a general understanding and basic principles to be considered in any post-conflict reconstruction efforts. Additionally, in the

post-conflict reconstruction, as well as post-disaster reconstruction, it is widely approved that the efforts should also operate within the Build Back Better principle, an effort to reconstruct the affected areas beyond its original condition. Even though the interpretation of Build Back Better is not clearly defined, Kennedy et al. (2008) suggest that the build back better principle should cover five topics; materials, construction, community participation, standards, and grants. They further argue that the Build Back Better should be evaluated and measured from four aspects; (i) safety, security and livelihoods, (ii) improved connection between post-disaster reconstruction outcomes and the permanent communities, (iii) fairness and equity, (iv) connecting relief and development by tackling the root causes of vulnerability.

The above section has provided general understanding on the post-conflict reconstruction, as well as its links with the development discourse. Accordingly, the following sections will elaborate the major concerns in a post-conflict reconstruction.

2.5.7.3 Major concerns in a post-conflict reconstruction

Anand (2005) argues that the reconstruction of infrastructure in a post-conflict setting has to face at least nine challenges, which make post-conflict reconstruction different from infrastructure development in the normal condition. The first challenge is with regard to conflict as often a complex situation. Whilst most conflicts rooted to three main causes, economic, political, social and historical causes, they often interact to each other hence it is difficult to isolate or identify a single cause of conflict. The second challenge is the different perception on the level of importance of infrastructure reconstruction, which is mainly due to the severity of infrastructure damages and its role in the overall post-conflict reconstruction. Third, conflict normally weakened the institutions, erodes trust, and increases transaction costs. Where the main cause of conflict is due to ethnic fractionalisation, the principles of fairness and equity may be more crucial than resource efficiency. Fourth, problems and failures in the infrastructure reconstruction can be used by the opponent of peace as a weapon to confront the legitimacy and effectiveness of the reconstruction process, leading to demoralized workers and delays. Fifth, post-conflict infrastructure reconstruction may experience the problem of 'missing-baseline, which among others is due to the fact that post-conflict reconstruction needs to cover beyond what were actually damaged by the conflict, but also those which have deteriorated due to maintenance neglect, and those required to accelerate

the recovery. The sixth challenge is regarding the displacement of people. On the one hand, this will lead to a concentrated influx of displacement people, which eventually challenges the limited ability to appropriately take measures. On the other hand, displacement and migration also affect the availability and capacity of the human resources needed for the reconstruction. Seventh, the role of visual media may exaggerate the effect of infrastructure failure, frequently leading to donor agency working in 'sort things out quickly' rather than correctly. Eight, the involvement of international bodies and transition government may increase the expectation of local community regarding the standards and quality of infrastructures to be provided, regardless of whether such expectations are appropriate or affordable. The ninth major challenge is the governance dilemma with regards to determining the higher priority between institutional rebuilding and infrastructure reconstruction. Whilst institutional rebuilding may take significantly long time, reconstruction of infrastructure facilities in the absence of appropriate institutions may delay conflict recovery, particularly resulting from the better access for rebels to group and move or for the state military forces to oppress certain ethnic groups.

2.6 Summary and the links

This chapter reviews and synthesises the existing literature on the issues relevant to the research with the aim of capturing the knowledge and understanding with regards to the issues surrounding the disaster and disaster management (section 2.2), post-disaster road reconstruction (section 2.3), and the road infrastructure maintenance (section 2.4). This chapter has also provided thorough discussions and overviews on the context of disaster and road infrastructure condition in Indonesia and the Aceh province (section 2.5). The structural hierarchy of the governments, the financial and budgeting mechanism, and the special autonomy status of Aceh province have been described. Additionally, the general disaster trends, the impact of the earthquake and tsunami in 2004 in Indonesia, as well as the roles and tasks expected from the disaster management agency in Indonesia have been elaborated in detail. All of the aforementioned references to the literature eventually lead to the identification of problems, which justify and help shape the research objectives, which will be discussed in more detail in the following chapter.

Chapter - 3 RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter presented the comprehensive process of literature review and synthesis observing the various aspects of the research topics and the identification of the research gaps. Accordingly, this chapter rationalises the research methodology adopted in this study and will be presented in the following order.

- First, the process that leads to the derivation of aims, objectives and research questions of the study will be discussed in section 3.2 .
- Second, the identification of the research philosophy, research approach, research strategy, research choice, time horizons and data collection analysis technique which follow the Saunders onion approach is presented in the research methodological design in section 3.3.
- Third, the writing up process of the PhD thesis is elaborated in section 3.4.
- Ultimately, the credibility of the research is presented in section 3.5.

3.2 Derivation of aim, objectives and research questions

3.2.1 Initial stimulus for the research

The researcher's interest in the disaster management and post-disaster reconstruction issue initially emerged due to his personal work and life experience. First, as the researcher lived in the city of Banda Aceh, Indonesia, which was heavily devastated by the tsunami in December 2004, he witnessed and experienced himself the impact of the disaster to both the community and the built environment. Second, during the post-disaster reconstruction period, the researcher was also involved in the reconstruction through his assignments in a number of organisations working in the post-disaster recovery, including one which was involved in the reconstruction of infrastructure facilities throughout Aceh and Nias. It was during his assignment in the reconstruction of infrastructure facilities that he had his initial first-hand experience to learn about the challenges and issues in the reconstruction of road infrastructure in a post-disaster setting. The technical aspect of road construction, mixed with the financial, political, legal and socio cultural issues, complicated the project management and

reconstruction efforts. At this point, the researcher's interest to study more about post-disaster road infrastructure reconstruction grew. Third, as part of the post-disaster reconstruction initiatives, the government of Aceh launched a scholarship program for Acehnese people wanting to continue their study to a higher degree in order to recover their human resources, which were killed by the tsunami. The researcher applied for a place and was granted a scholarship to pursue a PhD degree.

These three factors accordingly and sequentially acted as the initial stimuli for the researcher to conduct a research on a PhD level. As the researcher's previous education was in the civil engineering and construction management areas, the PhD research was accordingly focused on the management aspect of the post-disaster road infrastructure reconstruction issue.

Even though the initial stimuli grew a strong interest to conduct a research in road infrastructure reconstruction issue, there were many aspects in the area that could and needed to be researched. To help funnel down the subject of interest and investigate the gaps in the body of knowledge, a literature review process was then conducted.

3.2.2 Literature review

For the literature review, the research commenced with broadly observing the context and identifying the gaps in the disaster management issue in Indonesia. Each phase of the disaster management cycle was examined and linked with the context of the local government in the developing countries and ultimately connected with the Indonesian context. Furthermore, a cross-sectional literature review was also conducted. Not only this process focused on the different phases of the disaster management cycle, it also scrutinised the different aspects and issues of the road management with regards to the disaster management cycle. At this point, the literature review process resulted in a number of issues potential for the research topics.

A more extensive literature review was then conducted in order to narrow down the potential research foci to the one that was suitable for the study. Journals, project reports, books, and webpages were incorporated as sources of information. Through the extensive literature review, the researcher then found that there were many issues identified in the road construction projects. The high uncertainties of field conditions and the high dependency of road projects on the weather and environmental condition, for instance, turns it to be the type

of projects with most possibilities of disruptions resulting in delays and cost escalations (please refer to section 2.3.4 of chapter two). On the other hand, the chaotic and dynamic nature of post-disaster reconstruction also aggravated the challenges and obstacles commonly faced in the normal development context (section 2.3.5).

Following the process of identifying and highlighting the potential research topics, a further literature review was again conducted. It was found that there was a gap in the literature which linked the issue of the road infrastructure maintenance with the post-disaster reconstruction process. Furthermore, all constraints, limitations, and the expected level of impacts that the outcomes of each topic alternatives might offer were put into consideration and were discussed with the supervisors. As a result, it was agreed that the study would be focused on linking the road maintenance and the post-disaster road reconstruction process. Following the establishment of the research focus, the initial aim of the study and a set of research objectives were then determined.

3.2.3 Pilot interviews

Following the extensive literature review process, two pilot interviews were conducted with the aim of fine-tuning the initially established set of aim and objectives of the study. The interviews were conducted with one consultant and one project manager who were involved in the post-disaster road reconstruction in Aceh, Indonesia. Both pilot interviews were conducted in semi-structured approach, using Skype teleconference facility. As a result, the pilot interviews were able to help the researcher highlighting the following concerns:

- As the post-disaster reconstruction activities had been virtually ended, there were concerns over the sustainability of the reconstruction assets.
- Due to the decentralised system, most of the reconstruction assets were registered at the district level. Hence, the local governments played the most important roles in maintaining them.
- There is a need to identify the underlying problems of the road maintenance issues.

From the pilot interviews, the aim, objectives, and the research questions of the study were further refined as presented in section 3.2.5. The process of the development of the final aim, research objectives and research questions is illustrated in Figure 3.1.

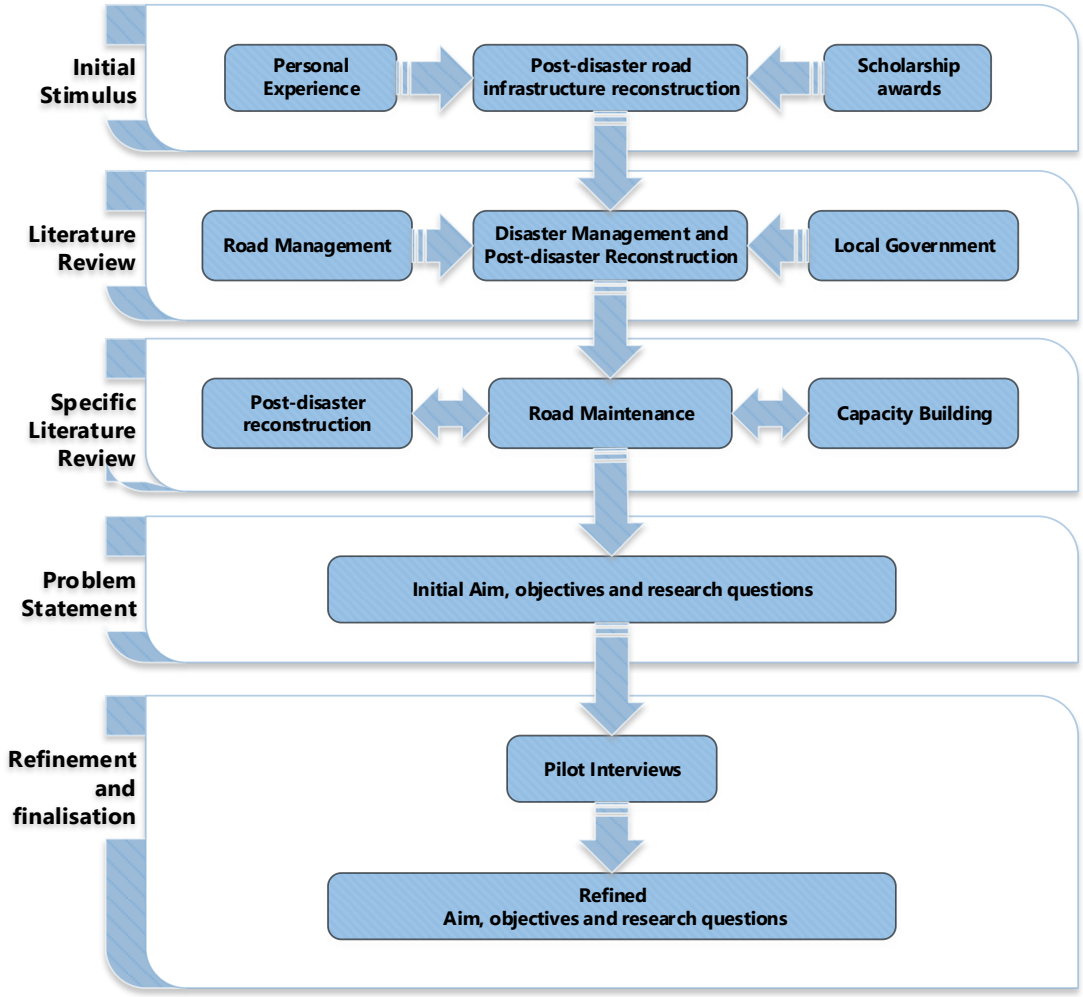


Figure 3.1 – Research Problem Identification Process

3.2.4 Identification of the research problem

As stated by Sekaran and Bougie (2013), a problem statement is academically relevant if nothing is known about a topic, much is known about the topic but the knowledge is scattered and not integrated, much research on the topic is available but the results are (partly) contradictory, or the established relationship does not hold in certain situations. In addition to being relevant, they further suggest that research problem also needs to be feasible, i.e. can be answered within the research restrictions. The restrictions may be due to time, money, availability of data, and expertise of the researcher. Accordingly, the process of identifying the research problem needs to put into account these constraints.

A significant number of studies have been undertaken by many researchers on the importance and challenges faced in the development of road transport infrastructure as described in the following. Perera et al., (2009) discovered how road construction projects are exposed to various risks thus requiring better handling strategies. Anapolsky (2002) and Waters (1999) identified the challenges associated with road construction projects in Montenegro and Poland, while Chang (2000) tried to evaluate losses and impact of earthquakes and the recovery of Port Kobe in Japan.

A number of studies also reveal that cost escalation has been a major issue in a road construction project. In response, studies have been undertaken to analyse bid patterns (Trefor, 2005), identify major causes of delays and their significance to road project delivery times (Odeck, 2004, Kaliba et al., 2009) and the development of the Neural Network based cost forecasting model (Hegazy and Ayed, 1998, Wichan et al., 2009). Moreover, Paul et al., (2009) conducted a study on eliminating delays through development of rapid construction method decision making. In addition to the previous list, studies on the impact of road construction projects on the community have also been undertaken into woman's occupations in Nigeria (Porter, 1995) and post-harvest crop losses in Malawi (Cheesman, 1993).

Despite the many studies that have been published on disasters and road construction areas, very little literature specifically covers the maintenance aspect of the road reconstruction in a post-disaster context. It is argued that the complexity and dynamic situation of working in a post–disaster environment requires particular discussion and should be distinguished from projects in a normal development context. Accordingly, the aim of this study is to fill the gap in the body of knowledge with regards to the maintenance of the post-disaster road reconstruction assets.

3.2.4.1 Opportunities in a disaster

As previously discussed in section 2.2.3.1, despite the damage and loss that disasters may cause to development, disasters may also provide opportunities. On the one hand, disasters may cause great suffering to people and cause significant setbacks in the development of a country through destruction of decades of social and economic investment, as well as the redirection of funds, which could have been used for development and reconstruction (UNDP, 2004). On

the other hand, however, disasters also offer opportunities for physical, social, political and environmental development that may not have been available previously (Asgary et al., 2008).

These opportunities were seen in Aceh and Nias post-disaster reconstruction. The amount of pledges made to Aceh and Nias exceeded the minimum fund required to restore the regions to their pre-disaster condition by US$1.3 billion (Subekti, 2009), therefore, it was possible to implement a 'build back better' scenario in the rehabilitation and the reconstruction of the affected region, beyond its original condition.

3.2.4.2 Local governments' poor road management capacity

In general, the lack of Aceh's local government capacity to maintain its assets has not been unrecognised. Burstedde (2009) identifies some gaps in the capacity of Aceh's local governments in asset management, including "data completeness, – currency, -availability, – maintenance, business processes, government procedures, staff (capacity and skills), lack of commitment from the decision makers, lack of organisation, unclear responsibilities and technical infrastructure." He also argues that to the local government of Aceh, asset management is "understood merely as a process of listing the asset inventory in a paper-based system; which resulted mainly from the requirement of the existing regulation." Whilst Burstedde's statement describes the gaps related to the asset-management issue in Aceh in general, these gaps are also relevant to the road infrastructure management in particular. Commitment from decision-makers and data completeness, currency, availability and data maintenance may lead to the preparation of inaccurate budget proposals and, hence, fund allocation.

To conclude, the decentralised system makes the local governments responsible for the management of road infrastructure in the long term. Accordingly, the local governments' roles and their capacities should be accounted for in a post-disaster road reconstruction plan. It is particularly important when the capacity of the local governments is poor and the amount of pledges made for the reconstruction of the region exceeds the actual needs; providing enough fund and greater opportunity to 'build back better' and extend the scope of work required (please refer to section 2.2.3.2 regarding post-disaster reconstruction fund). Accordingly, a strategy to adequately incorporate the local governments' capacity into the post-disaster road

reconstruction plan is considered to be the key to ensuring that the investment made in the road infrastructure reconstruction yields the maximum value.

3.2.5 Research aim, objectives and research questions

The process of identifying the research problems eventually led to the establishment of the aim, objectives and research questions of the study, which will be summarised as the following.

3.2.5.1 Aim of the research

The aim of the study is to evaluate the capacity of the local governments in the maintenance of the road infrastructure assets within the context of the post-disaster reconstruction process.

3.2.5.2 Research objectives

The following objectives are formulated to achieve the aim.

- To explore the road infrastructure reconstruction process, policy and management model in Indonesia at the national and the local government level
- To identify and analyse the obstacles and challenges of the road reconstruction in a post-disaster context.
- To analyse the local government's roles in the road infrastructure reconstruction and their capacity in the maintenance of road infrastructure assets.
- To develop a framework for post-disaster reconstruction of road infrastructure and the local government capacity in the maintenance of road infrastructure assets.

3.2.5.3 Research questions

In order to achieve the aforementioned objectives, the following research questions have been identified:

- What are the roles of local governments in the post-disaster road infrastructure reconstruction process?
- What management model and strategy are used for the road maintenance in Indonesia at the national and the local government level?
- What are the challenges faced by local government in the maintenance of road infrastructure assets?

- What is the status of the local governments' capacity in maintaining the road infrastructure assets?

The above section describes the aim, objectives, and research questions of this study. The following section will accordingly present the methodological design in which way they will be achieved and answered.

3.3 Research methodological design

Prior to conducting any research, it is essential that the methodology of the research is prepared. Research methodology is defined as the overall approach to be used in the research process, from the theoretical underpinning to the collection and analysis of the data (Collis and Hussey, 2009). In order to explain the appropriate research methodology for this research, the researcher will follow the 'research onion' model proposed by Saunders et al., (2009). This model is followed due to its clear definitions and systematic order of process starting from the philosophical stance of the research in the outer layer, down to the central point of the research onion which is the data collection and data analysis process.

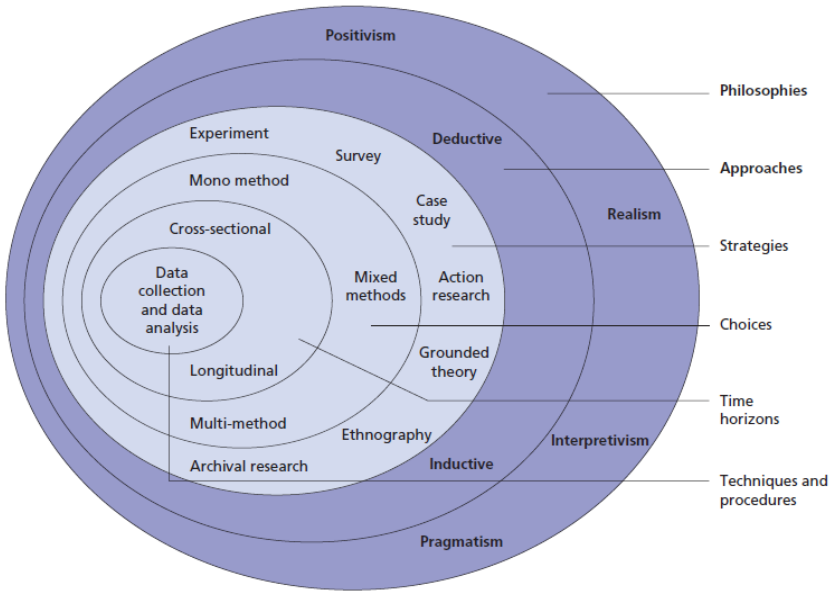


Figure 3.2 – Saunders' Research Onion Model

Source: Saunders et al. (2009)

However, researcher following the Saunders model of research methodological design should be aware that the components and layers of the onion are not mutually exclusive to each other. For instance, a researcher may adopt more than one research strategies (eq. utilising both case study and survey strategies for certain part of the research), and that a research may use both deductive and inductive approach for the different part of the studies.

Having described the justification for using Saunders's onion model, the remainder of this section will accordingly elaborate the research methodology of this study following the steps of the research onion model, starting with the research philosophy as the first layer.

3.3.1 Research Philosophy

The outer layer of the research onion is the philosophy of the research. Saunders et al., (2009) express research philosophy as an over-arching term that relates to the development of knowledge and the nature of that knowledge. He also points out that the adopted philosophy and assumptions will underpin the research strategy and methods which follow as part of the strategy and it would be misleading to think that one philosophy is 'better' than another as they are 'better' at doing different things. Furthermore, Easterby-Smith (2002) suggests that understanding research philosophy is important for at least three reasons:

- It can help to clarify research designs;
- It can help the researcher to recognize which design will work and which will not
- It can help the researcher to identify, and even create, designs that may be outside his or her past experience.

Most literature classifies research philosophy into three main perspectives, namely ontology, epistemology and axiology (Saunders et al., 2009). Accordingly, the following paragraphs will provide a brief summary of each perspective and later describe the philosophical stance of this study.

3.3.1.1 Ontology

Ontology concerns the nature of reality and assumptions about the way in which the world works (Saunders et al., 2009). There are two aspects of the ontological position; objectivism and subjectivism. At one end of the spectrum, objectivism assumes that social entities exist in

reality external to the social actor concerned with their existence. At the other end of the spectrum, the term subjectivism holds that social phenomena are created from the perceptions and consequent actions of those social actors concerned with their existence and is often associated with social constructionism that views reality as being 'socially constructed' by different social actors (Saunders et al., 2009). Remenyi et al. (1998) also stress the importance of knowing "the details of the situation to understand the reality or perhaps a reality working behind them."

3.3.1.2 Epistemology

Epistemology concerns what is acceptable knowledge in a particular field of study (Saunders et al., 2009). In their book, Easterby-Smith et al. (2002) define epistemology as a general set of assumptions about the best ways of inquiring into the nature of the world. There are different names assigned to philosophical stances within epistemology, but they generally have similar meanings. Saunders et al. (2009) distinguish epistemological stances into positivism and interpretivism while Remenyi et al. (1998) categorise them as positivism and phenomenology.

According to Saunders et al. (2009), a research using a positivism philosophy is likely to represent a natural scientific approach where only observable phenomena can lead to credible data. In a similar fashion, Remenyi et al. (1998) add that working within a positivism philosophy implies that the researcher is working with an observable social reality and that the end product of such research can be the derivation of laws or law-like generalisation similar to those produced by the physical and natural scientist. A researcher adopting a positivism approach will be concerned with facts rather than impressions and undertake the research in a value-free way (Saunders et al., 2009).

On the other end, the interpretivism approach recognises the differences that exist between humans as social actors and encourages the researcher to understand such differences(Saunders et al., 2009). The challenge for a researcher adopting the interpretivism approach would be to enter the social world of the research subjects and understand their world from their point of view (Saunders et al., 2009).

3.3.1.3 Axiology

The third continuum in the research philosophy is axiology. Axiology is a branch of philosophy that studies judgement about values. These value judgments may lead to the drawing of conclusion which may be different from those drawn by the researcher with other values. The main emphasis in this philosophical branch is whether research assumptions are made in a value-laden or value-free environment (Collis and Hussey, 2009).

3.3.1.4 Philosophical stance of this study

Within the context of the research philosophy, the aim of this research is to evaluate the capacity of the local governments in the maintenance of the road infrastructure assets within the context of the post-disaster reconstruction process in Aceh, Indonesia. As this process involves different stakeholders and the fact that their 'subjective' perceptions and decisions collectively 'socially construct' what was seen as the road reconstruction 'phenomena', the ontological stance of this research falls on the subjectivism continuum. Additionally, this research adds special emphasis upon the involvement and the role of the local governments in the road reconstruction process. The different perceptions and experiences of the various stakeholders involved in the reconstruction process will be analysed. Their interpretation of the phenomena found in the road reconstruction process will vary according to, among other, the role, responsibility, capacity and level of experience of each stakeholder. Accordingly, this research recognises and values such differences and will therefore utilise the in-depth semi-structured interviews with a number of stakeholders and experts to understand their different perceptions. From that point of view, the epistemological stance adopted by this research lies in the interpretivism approach.

In addition, the data collection process includes interviews with different sources. The researcher believes that personal interaction with the interviewees is of high importance in order to obtain a good insight into the interviewees' perceptions and to understand the context of the phenomena being discussed. Hence, from the axiological stance, this research will be value-laden in nature.

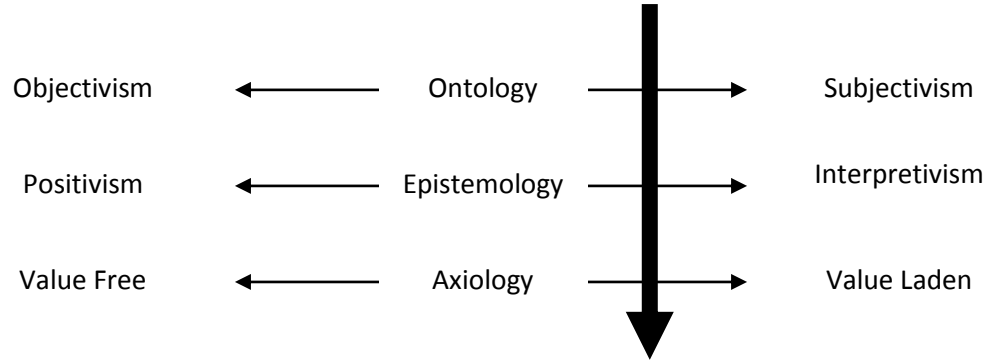


Figure 3.3 – The Research Philosophy of This Study

The above figure summarises the philosophical stance of this study. Furthermore, following the Saunders research onion layers, the next section will discuss the appropriate research approach for this study.

3.3.2 Research Approach

According to Saunders et al. (2009), the research approach relates to the way in which theory is developed. There are two types of approaches to research, deductive and inductive. In the deductive approach, the researcher develops theory and hypothesis (or hypotheses), expresses the hypotheses in operational terms to explain the relationship between variables, and tests these hypotheses prior to examining the specific outcomes and if necessary, modifies the theory according to the findings (Robson, 2002 cited in Saunders et al., 2009).

In the deductive approach, Saunders et al. (2009) describe that the causal relationship between variables is developed with the researcher being independent of what being observed in order to satisfy the principle of scientific rigour. In the inductive approach, in contrast, no theory is developed prior to data collection. Instead of creating a cause and effect link independently as in the deductive approach, a research using an inductive approach believes that an insight into the way in which humans interpret and perceive their social world is critical and is particularly concerned with the context in which such events take place.

This research is mainly a combination of exploratory and explanatory. The main purposes of this research are to evaluate the post-disaster road reconstruction process in Aceh,

investigating the capacity of the local governments in maintaining the reconstructed assets, as well as to understand the reasons behind the phenomena being studied.

At the initial phase the research deductively obtained understanding and created certain assumptions based on the findings from the literature review and pilot interviews. However, at the later stage, apart from the understanding gained from literature and document reviews, no theories and propositions or hypotheses were made for testing. Instead, the primary data was collected through semi-structured interviews and document analysis from which a conclusion would be made at a later stage. Accordingly, from that perspective, this research mainly used an inductive approach. More details on the different approaches adopted in the study with regards to the development of theory are presented in Figure 3.4.

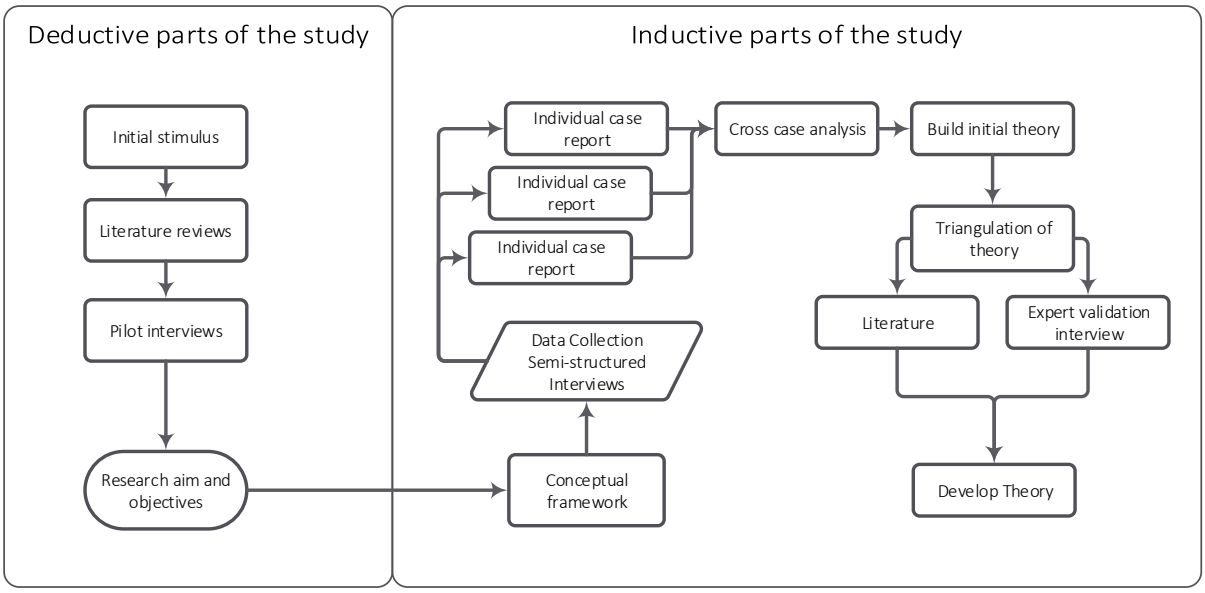


Figure 3.4 – The process of theory building

The next layer of the research onion is the research strategy. Therefore, the various strategies suitable for this study are discussed in the following section.

3.3.3 Research Strategy

In conducting a research, there are a number of strategies or approaches that can be adopted. The choice of an appropriate research strategy for a study is based on the research questions

and objectives (Avison et al., 1999, Saunders et al., 2009), the extent of existing knowledge, the amount of time and other resources available and the philosophical underpinnings (Saunders et al., 2009).

Yin (2003) divides research strategies into experiment, survey, archival analysis, history and case study. In addition to these strategies, Saunders et al., (2009) add action research, grounded theory and ethnography into the research strategy list. Each research strategy has its own advantages and disadvantages. However, a common misconception is that the various research strategies should be arrayed hierarchically and that certain strategy will only fit certain phase of the research (Yin, 2003). In fact, each strategy can be used for all three research purposes; exploratory, descriptive or explanatory. Instead of distinguishing the strategies hierarchically, Yin (2003) argues that there are three other conditions for identifying research strategy; the type of research question posed, the extent of control an investigator has over the actual behavioural events, and the degree of focus on contemporary as opposed to historical events. Even though each strategy has its distinctive characteristics, there are also large overlaps among them (Yin, 2003). The following table summarises characteristics of each strategy.

Table 3.1 – Relevant Situations for Different Research Strategies

Strategy	*Form of research questions*	*Requires control of behavioural events?*	*Focuses on contemporary events?*
Experiment	***How, why***	***Yes***	***Yes***
Survey	***Who, what, where, how many/much***	***No***	***Yes***
Archival analysis	***Who, what, where, how many/much***	***No***	***Yes/No***
History	***How, why***	***No***	***No***
Case study	***How, why***	***No***	***Yes***

Source: COSMOS, cited in Yin (2003)

The first condition for identifying a research strategy concerns the type of research questions, which are commonly categorized into 'who', 'what', 'where', 'how', and 'why' type of questions (Yin, 2003). The purpose of this study is partly exploratory, which is to find out and understand what happened in the post-disaster road reconstruction in Aceh. This is reflected in the 'how'

type of research questions developed for this study, which includes 'how was road reconstruction in Aceh managed and delivered at the local level?' From this point of view, this study may therefore adopt any of the five strategies described above.

However, the remaining questions of this study also include the 'why' type of questions, as the second purpose of this study is also explanatory. This means that in addition to finding out what actually happened in the road reconstruction process in Aceh through addressing some 'how' type of questions, this study is also aiming at understanding 'why' such phenomena occurred and therefore need to establish causal-links between the observed phenomena. For instance, through the interviews with the key stakeholders, this study aims to get an insight into the decision-making process, the process of finding and creating solutions for the challenges and obstacles experienced in the project delivery, as well as in the maintenance of the road assets once the construction is completed.

Since the survey and archival analysis strategy may not be suitable to answer the 'why' type of research questions, as far as the research questions are concerned, the survey and archival analysis strategies are considered inappropriate for this study. Therefore, the experiment, history and case study remain the possible options of research strategy for this study.

The second conditions that Yin (2003) emphasises is related to the ability and requirement to control the behavioural events. As summarised in Table 3.1, this condition is obviously required for an experimental method. The experimental method owes much to the natural science where the purpose is to study the causal-links through observing the effect of interventions of one independent variable towards another dependent variable (Hakim, 2000 cited in Saunders et al., 2009). Additionally, Yin (2003) stresses that experimental method is done when an investigator can manipulate behaviour directly, precisely and systematically. In order to achieve the greater control over aspects of the research, experiment researches are often conducted in the laboratories rather than in the field (Saunders et al., 2009). Since this research does not have control over the behavioural events being studied, conducting an experiment research is accordingly not possible. At this point, the remaining possible options for this study are the historical and case study method.

To identify the more appropriate strategy between the remaining two options, the third condition is applicable. This condition is related to the degree of focus on the contemporary as opposed to the historical events. Whilst the historical method focuses on past events where documents and cultural and physical artefacts are used as the main sources of evidence, the case study has two additional techniques not usually included in the historical method; direct observation and interviews (Yin, 2003). Many aspects of these research strategies are overlapping. However, the case study's unique strength is its ability to use a vast range of source of evidence beyond that which might be available in a conventional historical study (Yin, 2003). This research mainly concerns with issues that happened in the past - the road reconstruction in Aceh post-disaster recovery, which has now completed. However, even though the road reconstruction in Aceh has completed, it can be considered as contemporary since the issue is still relevant to present conditions and many of the stakeholders and experts involved in the process are still available to provide input for this study through interviews. Direct observation in the field is also possible to be used as one source of evidence for this study. Accordingly, based on the aforementioned justification, the case study method is considered to be the most appropriate for this research and thus is adopted.

In addition to Yin's list of research strategy, Saunders et al. (2009) add action research, grounded theory and ethnography as the possible options for research strategy. To complete the justifications for the research strategy selection, the following paragraphs will elaborate the possibility of using any of these alternatives for this study.

According to Avison et al., (1999), action research is a unique method in the way it associates research and practice, so research informs practice and practice informs research synergistically. Saunders et al. (2009) stress the strengths of an action research strategy as it focuses on change, the recognition that time needs to be devoted to diagnosing, planning, taking action and evaluating, and the involvement of employees (practitioners) throughout the process. Additionally, action research is an iterative process involving both researchers and practitioners acting together on a particular cycle of activities (Avison et al., 1999) that forms a continuing action of diagnosing, planning, taking action and evaluating (Saunders et al., 2009). To achieve the intended objective, Schein (1999 cited in Saunders et al., 2009) emphasises the importance of involvement of the employee (as part of the research objects) throughout the

research process, as they are more likely to implement change they have helped to create. From this point of view, it is accordingly both the lack of the required access to perform intervention towards the organisation and phenomena being studied and the inappropriateness with the research objectives which hinder the adoption of action research as a strategy for this study.

Additionally, grounded theory can be seen as a process of 'theory building' through a combination of induction and deduction approach (Saunders et al., 2009). In the grounded theory, data collection starts without the formation of an initial theoretical framework and the theory is developed from data generated by a series of observations that lead to the generation of predictions, which are then tested in further observations that may or may not confirm the predictions (Saunders et al., 2009). Even though this strategy is considered a possible alternative, it is argued that developing an initial framework based on the available literature on the road management and road reconstruction project in the non-disaster context as a starting point would be a more efficient and effective strategy. This approach is adopted based on the result of the literature review and the initial observation which suggests that most of the post-disaster road reconstruction projects are indeed delivered based on the best practice of road projects in a non-disaster context with the addition of some waivers and exceptions to accommodate the challenges, uncertainties and dynamic condition of a post-disaster reconstruction. Hence, even though considered as a possible alternative, grounded theory strategy is not selected for this study.

The next research strategy is ethnographic. Saunders et al., (2009) refer to this strategy as "a research strategy that is very time-consuming and takes place over an extended time period as the researcher needs to immerse herself or himself in the social world being researched as completely as possible." In addition to seeing the above factors as obstacles for this study, this study also does not see the benefit of immersing deeply into one particular group towards achieving the research objectives and answering the research questions of this study. Therefore, the ethnographic method is not suitable for this study.

Based on the above reasoning and justification, the case study strategy is considered as the most appropriate strategy for answering the research questions of this study. However, as

Saunders et al., (2009) emphasise, the aforementioned research strategies should not be thought of as being mutually exclusive and that the combinations or use of more than one strategies in one research is, in fact, quite possible. The next section provides a more detailed discussion of the variant of case studies and one which is adopted in this study.

3.3.3.1 Case study design of the study

Having determined that case study as the appropriate strategy for this study, the next concern is with regard to the type of case study design, which best suited the research. Yin (2003) classifies four types of case study designs that are commonly used in research. The 2x2 cases study matrix consists of single and multiple-case study in one direction and the unit of analysis of the study – holistic and embedded designs – in the other direction. Simply, the types of case study designs are (1) Single-case holistic, (2) Single-case embedded, (3) Multiple-case holistic, and (4) Multiple-case embedded. The case study type matrix is shown in Figure 3.5.

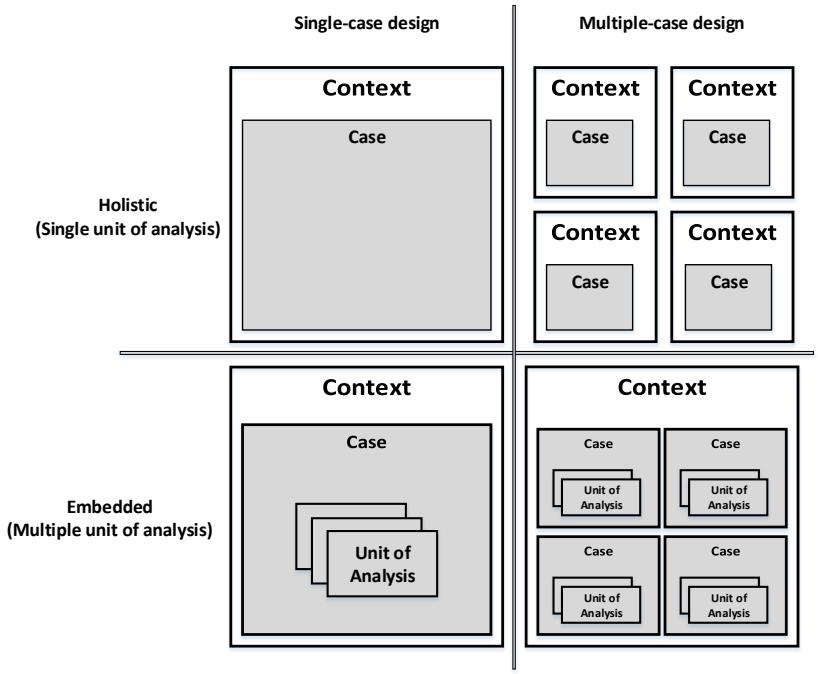


Figure 3.5 – Basic types of case study design

Source: Yin (2003)

Compared to single-case study, multiple-case study designs have distinct advantages. A single case study is justifiable when the case represents (a) a critical test of existing theory, (b) a rare

or unique circumstance, (c) a representative or typical case, or when the case serves a (d) revelatory or (e) longitudinal purpose (Yin, 2003). Nevertheless, the most important advantages of a multiple-case study design are that the evidence can be more compelling and that the study is more robust. Therefore, Yin (2003) suggests that if the choice and resources are available, multiple-case design may be preferred as it may provide the possibility of direct replication and more powerful analytic conclusions. He also adds that if common conclusions are found from the cases, it will also expand the generalizability of the findings. Additionally, Amaratunga and Baldry (2001) suggest that multiple case study approach would strengthen the results through replication of the matching pattern which increase confidence in the robustness of the theory.

The post-disaster road reconstruction in Aceh was coordinated by a government body specially established following the 2004 tsunami and the subsequent earthquake in 2005 called *Badan Rehabilitasi dan Rekonstruksi – BRR (Rehabilitation and Reconstruction Agency)*. Even though BRR was in charge for coordinating the overall reconstruction activities, the road reconstruction projects were run and funded by different donor agencies that used different approaches and regulations in their project. Additionally, the road reconstruction projects were scattered over the province of Aceh and Nias Island and had to involve different local governments with different levels of resources and capacities, and also with different environmental conditions. Hence, in accordance with Yin's rationale for doing multiple-case design and the nature of the research objects, this study sees an opportunity to get better research outcomes if the multiple-case study approach is adopted.

As far as the unit of analysis is concerned, this study is focused on evaluating the capacity of the local governments in the maintenance of the post-disaster road reconstruction assets. The research will evaluate and link the road maintenance aspect with the process of post-disaster road infrastructure reconstruction. Therefore, the case study design for this research falls into the multiple-case holistic category, where the unit of analysis being the capacity of the local governments in the maintenance of the road assets.

Having discussed the various possible strategies to answer the research questions of the study which resulted in multiple-case holistic type considered as the most appropriate strategy, the following section will accordingly present the criteria of the case study.

3.3.3.2 Case study criteria

As discussed in section 3.3.3.1, it is argued that the most appropriate methodology to address the research aims and objectives as well as to answer the research questions is by adopting a multiple case study strategy. Accordingly, the study needs to develop a set of criteria within which districts are considered eligible for the study. For the purpose of answering the research questions of the study, the researcher has developed the case study selection criteria to justify the selection of the research focus areas.

3.3.3.2.1 The district was directly affected by the 2004 earthquake and tsunami

This research limits its focus on evaluating the capacity of the local governments to maintain the road reconstruction assets in the areas directly affected by the earthquake and 2004 tsunami in Aceh Province, Indonesia. Therefore, the geographical areas concerned are the 8 districts on the north and the West Coast area of the Aceh province which include:

1. Aceh Besar,
2. Aceh Jaya,
3. Aceh Barat,
4. Nagan Raya,
5. Aceh Barat Daya,
6. Aceh Selatan,
7. Singkil and
8. Simeulue.

The geographical position of the district is illustrated in Figure 3.6

Figure 3.6 – Map of the Aceh Province and the tsunami affected districts in the West Coast area

Being directly affected by the tsunami wave, the above 8 districts were eligible for the case study. However, in addition to being directly affected by the tsunami, there are also other criteria that need to be satisfied, which will be discussed in the following section.

3.3.3.2.2 The district was established prior to the tsunami in 2004.

The decentralised system in Indonesia allows for the separation and unification of districts. However, as stipulated in section 3.2.5.2, one of the objectives of the study is to analyse the roles of the local governments in the post-disaster road reconstruction process and their capacity in the maintenance of post-disaster road infrastructure assets. Additionally, as the study is also a cross-sectional study (refer to section 3.3.5 for more details), the case study districts for the research will need to be established prior to the tsunami disaster on 26th December 2004. This is a particularly important requirement as it will be irrelevant to conduct a cross-sectional research onto a subject that did not practically exist in the period of time on which the research is being conducted.

More details on the establishment date of the West Coast Aceh cities and districts are presented in the following Table 3.2.

Table 3.2 – Establishment date of Aceh West Coast districts

District/ City	*Establishment data*	*References*
Aceh Besar	***4 November 1956***	***Emergency Law no 7/1956***
Aceh Jaya	***10 April 2002***	***Law no 4/2002***
Aceh Barat	***4 November 1956***	***Emergency Law no 7/1956***
Nagan Raya	***10 April 2002***	***Law no 4/2002***
Aceh Barat Daya	***10 April 2002***	***Law no 4/2002***
Aceh Selatan	***4 November 1956***	***Emergency Law no 7/1956***
Singkil	***20 April 1999,***	***Law no 14/1999***
Simeulue	***4 October 1999 -***	***Law no 48/1999***

Based on the above criteria, all of the 8 districts remain eligible for the case studies.

3.3.3.2.3 The districts had road projects implemented under the post-tsunami reconstruction scheme

As the study focuses on the post-disaster reconstruction of road infrastructure, the case studies of the research will need to have had road projects in their area under the post-disaster reconstruction scheme. From this perspective, all the above districts were also eligible for the study.

3.3.3.2.4 The availability and access to data

In addition to the aforementioned criteria, the blanket criteria will be the availability of access to data. Included here is the acceptance of the interviewees representing the districts to participate in the study through interviews.

3.3.3.3 The selection of the case studies

As the study adopted multiple-case studies approach, the replication logic was used in the selection of the case study. With regards to determining the number of case study in a qualitative study, Yin (2013) suggests that the process should be led by the findings of the original or the first case study. As he further explains, each additional case study must be carefully selected so that it either (a) predict similar results (literal replication) or (b) predicts

contrasting results bur for anticipatable reasons (theoretical replication). Accordingly, it is argued that the theoretical replication approach is more appropriate for a study which allows for replicating and conducting a relatively large number of case studies. The theoretical replication would be then used to support the initial proposition resulted from the original case study and the literal replication process conducted earlier. As this study is constrained by the PhD period, time, and resources (refer to section 7.4 of chapter 7 for more discussion on the limitations of the study), the study was accordingly focused on using the literal replication approach only.

Amaratunga and Baldry (2001) argue that the process of selecting the cases for a research inevitably involved discretion and judgment, which may be based on convenient of access whilst exhibiting the appropriate components to be observed. Accordingly, as the starting point, the research commenced with Aceh Besar district as the main case study. Aceh Besar was selected as the main case study as it was one of the most devastated districts by the tsunami and was located near the provincial capital. Accordingly, the access to data, location, and the respondents for the interviews were expected to be more conveniently available to be used as a starting point. As it turned out later in the data collection process, the respondents from the Aceh Besar were among the first to respond to the researcher's request for interviews.

The case studies of the research were further progressed to also include other districts meeting the case study criteria as set in section 3.3.3.2 and was stopped when the data saturation had been achieved and that expanding the study was not expected to yield new information. The saturation point was achieved after collecting more data from the district of Aceh Jaya and Aceh Barat Daya. Accordingly, the case studies of this research were Aceh Besar, Aceh Jaya, and Aceh Barat Daya.

The above sections have presented and discussed in detail the research strategy adopted for this study, as well as the criteria and the process of the case study selection. Accordingly, the next section will elaborate the next layer of Saunders' research onion concerning the research choices.

3.3.4 Research Choices

The next step of the research design according to Saunders' research onion model is to determine the research choice. Research choice concerns whether qualitative or quantitative data, or both, is used for the study. Saunders et al. (2009) point out that the individual quantitative and qualitative techniques and procedures do not exist in isolation and classifies research choices into two main categories; mono method and multiple methods

Mono method refers to using a single data collection technique and its corresponding data analysis procedures whilst the multiple methods is where more than one data collection techniques and analysis procedure is used to answer the research questions of a study. Furthermore, multiple methods can be divided into the multi-method and mixed-methods study. Multi-method is defined as using more than one method, either quantitatively or qualitatively, in a single study and analyse them in accordance with their relevant procedures. Meanwhile, mixed-method is defined as using both quantitative and qualitative data collection techniques and analysis procedures in one research design.

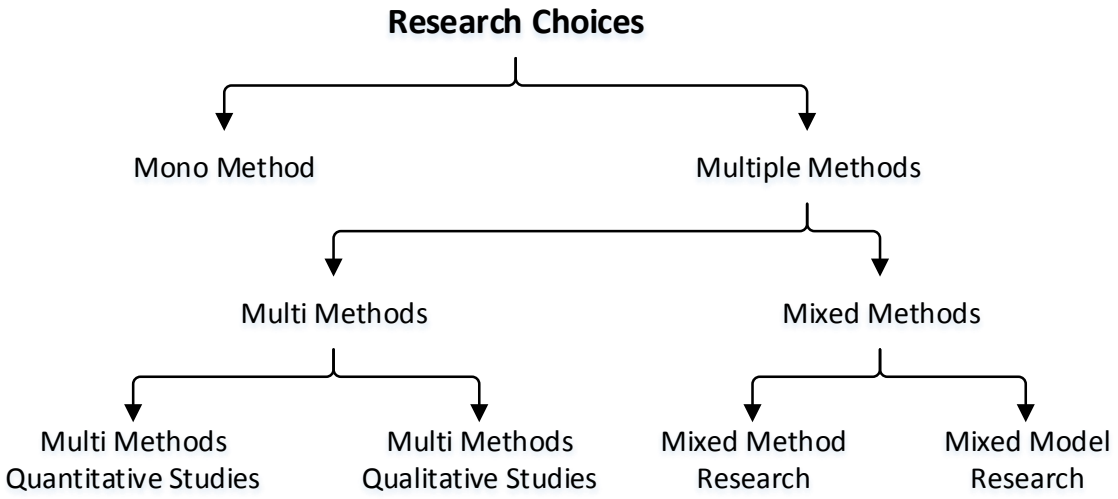


Figure 3.7 – Research choices

Source: Saunders et al. (2009)

Furthermore, when quantitative and qualitative data collection and analysis procedures are used in parallel or sequential time in a study, the study is referred to as using a mixed-method research. Additionally, if the study combines the qualitative and quantitative techniques and

procedures, the study is referred to as using a mixed-model research. Accordingly, this study will organize more than one data collection techniques in the form of semi-structured interviews and documents. It will accordingly use the content-analysis technique for the data analysis procedures. Hence, from this perspective, this study falls into the multi-method qualitative-studies type of research.

The next section will 'peel off' the next layer of the research onion, which is the time horizon of the study.

3.3.5 Time horizon

A better way of understanding the 'time horizon' aspect of a research is by looking at the features of the time horizon subdivisions. The time horizon of a study can be divided into the cross-sectional and longitudinal. A study is considered to be a cross-sectional when the study focuses on a particular phenomenon (or phenomena) at a particular time; while in contrast a longitudinal study focuses on a particular phenomenon (or phenomena) and observes their changes and developments over time (Saunders et al., 2009, Sekaran and Bougie, 2013).

With regards to this issue, the main aim of the study is 'to evaluate the capacity of the local governments in the maintenance of the road infrastructure assets within the context of the post-disaster reconstruction process'. Here, the study is looking at a 'snapshot' of time, which is the post-disaster reconstruction period; with particular attention given to the time when the maintenance of the post-disaster road infrastructure assets process took place. The study is also not trying to compare or observe changes to, or development of, any particular phenomenon being studied over a period of time. Hence, from a time horizon perspective, this research can be considered as a cross-sectional study.

The next section will provide a brief discussion on the research techniques adopted in this study, which will include data collection and data analysis techniques.

3.3.6 Research Techniques

Research techniques relate to data collection and their analysis procedures. Walliman (2006) defines data as the raw materials of research that can be interpreted and refined into conclusions. Moreover, he argues that even though data can be collected from virtually

everywhere, it needs a plan of action that identifies and uses the most effective and appropriate methods of data collection. Accordingly, this section will elaborate on data collection techniques and the analysis procedures adopted in this study.

One of the main advantages of case study research is the opportunity to employ various data collection techniques. According to Yin (2003), the sources of evidence for case study research may be obtained from six sources; documents, archival records, interviews, direct observation, participant observation and physical artefact. To maximize the benefit of these sources of evidence he suggests to follow three principles; using multiple sources of evidence as it allows an investigator to yield a more convincing and accurate conclusion; creating a case study database which enables independent inspections and allows other investigators to review the evidence directly and not be limited to the written case study reports; maintaining a chain of evidence, which will allow the external observer to follow the derivation of any evidence and trace the steps in either direction.

Furthermore, among the many sources of evidence that can be employed for a case study, this research will primarily collect data through documents, archival records, and semi-structured interviews. The following section will accordingly elaborate the data collection techniques adopted in this research, initiated with the discussion of documents as the source of evidence.

3.3.6.1 Documents and archival records

The post-disaster road-reconstruction projects in Aceh involved an extensive number of government bodies, NGOs, media, donors and international aid agencies. Accordingly, they have also produced a number of progress reports, lessons learnt reports, news articles - most of which are available for public access. These documents will be one of the main sources of evidence for this study. Also, information obtained from these documents, including the results from the literature reviews, was used to develop the list of questions used for the semi-structured interviews. In addition to the aforementioned sources, legal and regulatory documents such as laws, presidential decrees, and government regulations would also be included as sources of evidence.

In addition to documents and semi-structured interviews, archival records that come in the form of statistical data, maps and charts from the relevant agencies were also used as input to

this study. Among others, the archival records used in the study include the annual budget allocation and the statistical data of the respective case studies.

3.3.6.2 Semi-structured interviews

In addition to documents and archival records, semi-structured interview was also adopted as one of the data collection techniques. As stipulated earlier, in addition to answering the 'how' type of questions, this study is also trying to answer a number of 'why' questions. This requires profound understanding and justification over, for example, certain decision-making processes and solutions to particular issues. Such understanding is expected to be achieved by doing semi-structured interviews with a number of stakeholders and experts in the road-reconstruction context.

With regards to types of interviews, Saunders et al. (2009) highlights that a structured interview is conducted by presenting the interviewees a set of identical questions and also often in a same sequencing order and pre-coded answers. A structured interview aims at quantifying the responses, hence it is also called a 'quantitative research interview'. On the other hand, unstructured interviews do not have a predetermined set of questions. The topic or topics of the interview are set, but the interview flows freely about the topic area. Questions are often posed based on the responses of the interviewee. This type of interview is also called as 'informant interview' as it is the informant's perception that leads the conduct of the interview (Saunders et al., 2009). An unstructured interview is more appropriate for the exploratory type of research.

Semi-structured interviews sit between the aforementioned two types of interviews. When conducting semi-structured interviews, a set of topics and questions to be covered is prepared as the interview flow guidance. Saunders et al. (2009) emphasise that the topics and questions may vary from an interview to interview, according to the specific organisational context and relevance to the research topic. Additionally, the questions may not need to be posed in a sequential order, but rather depend on the flow of the interviews.

By using a semi-structured interview, a researcher has the flexibility to explore the topics of interview by providing the interviewees a higher degree of freedom to communicate their perspectives which may not be available in a structured interview. On the other hand, by having

a set of topics and questions in hand, a semi-structured interview seems to be a more effective way to answering the research questions compared to the unstructured interviews where the respondent is given more control on the interview flow. Accordingly, based on the aforementioned advantages of the semi-structured interviews, this research adopted semi-structured interviews as the primary data collection technique. The research conducted three types of semi-structured interviews; high-level, case-study, and expert validation semi-structured interviews. Each of these types of interviews will be discussed in more detail in section 3.3.6.2.2, 3.3.6.2.3, and 3.3.6.2.4 which will be presented following the discussion on the sampling technique below.

3.3.6.2.1 Sampling techniques

With regards to the sampling techniques, there are two approaches that can be used for data collection, probability sampling and non-probability sampling (Saunders et al., 2009, Berg and Lune, 2012, Sekaran and Bougie, 2013). A sampling technique is referred to as probability sampling when the probability of each member of the population is known. On the other hand, when the probability of each member of the population being included as the samples is not known, it is called non-probability sampling. Determining which sampling technique is more suitable for a study depends on the nature of the research.

As this research is trying to get insight into the capacity of the local government in the maintenance of the post-disaster reconstruction assets, and also aims at evaluating the process of the post-disaster road infrastructure reconstruction in Aceh, Indonesia, it would then require the involvement of participants that have knowledge and experience in this area. Accordingly, as the research is targeting participants with specific criteria, non-probability sampling is considered to be the most appropriate way to answer the research objective. This view is also supported by Berg and Lune (2012), who highlight that non-probability sampling tends to be the norm of a qualitative study.

Berg and Lune (2012) underline that there are four types of non-probability sampling commonly used in a research; quota sampling, purposive sampling, snowball sampling, and convenience sampling. Similarly, Saunders et al. (2009) add self-selection sampling to the list.

Each of the sampling techniques has its own characteristic which selection should therefore be made based on the needs and nature of the research.

For the purpose of the data collection utilising semi-structured interview, a combination of purposive sampling and snowball method were used. A purposive sampling obtains its samples based on the relevance and knowledge of the participants. Whilst the relevance is related to the issue or theory being investigated, the knowledge aspect is related to the knowledge and experience of the participants about the issue. Sekaran and Bougie (2013) refer to judgement sampling as one forms of purposive sampling, and emphasise that this method is used when the information being sought lies in a limited number of category of people. Therefore, in such a case, any type of probability sampling will not be useful.

The purposive sampling method for the study was initiated by producing a list of interviewee criteria, based on their relevance and the expected level of knowledge and experience. The targeted interviewees were officials involved in the reconstruction of the road infrastructure who represent the main agencies involved in the reconstruction process. These include the BRR, donor agencies, planning agencies, public works, contractors and consultant. In addition, local government officials responsible for the planning and maintenance of road infrastructure were also included. At the next stage, government personnel responsible for the management of road infrastructure were identified. From the planning agency, officials responsible for the road infrastructure planning unit were included. From the public works department, the officials responsible for the management and the maintenance of the road infrastructure in the public works department were also included. Other relevant interviewees representing national government, donor agencies and private sectors were also identified. Furthermore, names and contact of the potential interviewees meeting the set criteria were obtained through reports, webpages, online search, as well as personal connection and referrals that the researcher had previously obtained. At the next step of the purposive sampling, the targeted interviewees were then contacted by email and telephone for their acceptance and willingness to be involved in the study. Further on, appointments were made at the agreed time and at the location suitable for the interviewees.

In addition to the purposive sampling method, the researcher was also aware that there might be relevant and knowledgeable respondents overlooked or not known to the researcher. Accordingly, the snowballing method was used to complement the purposive sampling method. The research sought advice and suggestions from different sources, including the targeted interviewees, regarding any relevant potential respondents suitable and available for the interview. The new referrals were then matched with the set criteria and were then contacted and asked for willingness to participate in the study, as well as to arrange the interview meetings. The research sampling methods adopted in the study are illustrated in the following Figure 3.8.

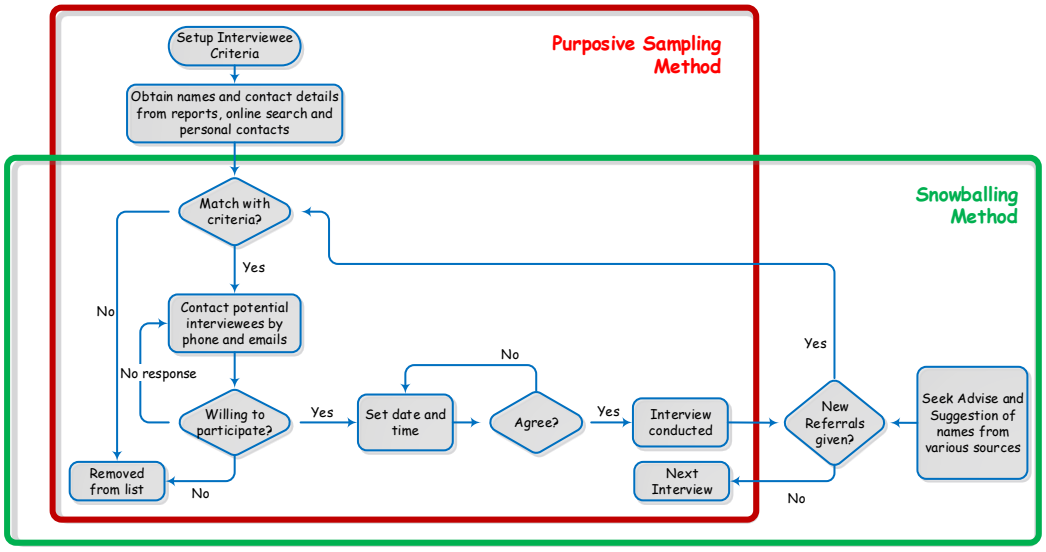


Figure 3.8 – Data collection technique and sampling method

With regards to the sampling technique as illustrated by Figure 3.8, the differences between the purposive and snowballing sampling method lie mainly in the way of selecting respondents for the interview. In the purposive sampling method, names of respondents are determined by the researcher on purpose, based on the criteria that have been set previously, hence called purposive sampling. On the other hand, snowballing method involved names of respondents being obtained or referred to by someone, often by one of the interviewees. The referred respondents may also give another referral. The process of referring respondents in this method resembles a rolling snowball, hence called snowballing method.

Having a list of potential interviewees, the researcher would then contact the potential interviewees by email or telephone communication. They were explained about the objectives of the interviews and what were expected from them from the interviews. If the potential interviewees accept to participate in the interviews, the location and time for the interviews were allocated and agreed based on both interviewees and researcher availability. Prior to interview, the interviewees were given the informed-consent sheet and signed as a proof of their acceptance and willingness to be involved in the study, as well as to assure the interviews' confidentiality. This sampling technique was adopted and applied to all three types of semi-structured interviews conducted in this study. Accordingly, the discussion will progress to the first type of the semi-structured interviews of the study with the high-level and policy-maker personnel.

3.3.6.2.2 High-level semi-structured interviews

At this stage of interviews, the high-level and policy-maker personnel involved in the reconstruction and the maintenance of road infrastructure in Indonesia were interviewed. In total, ten respondents were interviewed, represented the disaster management agency, the ministry of public works, the planning agency at the national and the provincial level, and donor organisations. The profiles of the respondents are presented in Table 3.3.

Table 3.3 – Profiles of respondents for the high-level semi-structured interviews

No	*Code*	*Organisation*	*Roles*
1	***PM01***	***Disaster Management Agency***	***Deputy for infrastructure***
2	***PM02***	***Disaster Management Agency***	***Deputy for finance***
3	***PM03***	***National Planning Agency***	***Director for Special Area and Disadvantaged Region***
4	***PM04***	***Disaster Management Agency***	***Director for Human Resource***
5	***PM05***	***Provincial Government***	***Provincial Secretary***
6	***PM06***	***Provincial Planning Agency***	***Head of road infrastructure planning***
7	***PM07***	***Donor Organisation***	***Project Manager***
8	***PM08***	***Donor Organisation***	***Operation Office***
9	***PM09***	***Ministry of Public Works***	***Head of National Road Service Region III***
10	***PM10***	***Dept. of Transportation***	***Head Division of road transportation***

The respondents for this type of interviews were selected using a sampling technique as discussed previously in section 3.3.6.2.1. Prior to the interview, an interview guideline was prepared to capture the respondents' perceptions on the challenges and obstacles experienced in the reconstruction and the maintenance of road infrastructure (please refer to Appendix B for the guideline). Particular focus was also addressed at the involvement and roles of the local governments in the post-disaster reconstruction in Aceh, with regards to the maintenance of the road infrastructure. The high-level interviews lasted for approximately 45 to 60 minutes. The data was then analysed using content analysis approach, which will be discussed in more detail in section 3.3.6.4.

3.3.6.2.3 Case study semi-structured Interviews

As explained in section 3.3.3.3, the research resulted in conducting three case studies; Aceh Besar, Aceh Jaya, and Aceh Barat Daya, all of which satisfied the requirement set as the case study criteria as discussed in section 3.3.3.2. As a result, eighteen respondents were interviewed at this stage, representing the three case studies which were selected based on the respondent criteria and sampling technique as described in section 3.3.6.2.1. Accordingly, the profiles of the respondents, and their affiliation to the case study are presented in Table 3.4.

As in the high-level semi-structured interviews, an interview guideline was prepared prior to the interview (please refer to Appendix C for the guideline). The interview guideline was prepared aiming at capturing the respondents' views and experiences in the reconstruction and the maintenance of the road infrastructure. Respondents were also asked for their hindsight on the factors affecting the performance of the local governments in maintaining the road assets, the process of capacity building in road maintenance aspect in the case studies, as well as with regards to the links between the road maintenance capacity and the post-disaster reconstruction process.

Table 3.4 – Profiles of respondents for case-study semi-structure interviews and their case study affiliation

No	Code	Organisation	Case One Aceh Besar	Case Two Aceh Jaya	Case Three Aceh Barat Daya
1	**CS01**	**Planning Agency**	**√**	**-**	**-**
2	**CS02**	**Public Works**	**√**	**-**	**-**
3	**CS03**	**Public Works**	**√**	**-**	**-**
4	**CS04**	**Public Works**	**√**	**-**	**-**
5	**CS05**	**Contractor**	**√**	**-**	**-**
6	**CS06**	**Contractor**	**√**	**-**	**-**
7	**CS07**	**Consultant**	**√**	**-**	**-**
8	**CS08**	**Planning Agency**	**-**	**√**	**-**
9	**CS09**	**Public Works**	**-**	**√**	**-**
10	**CS10**	**Public Works**	**-**	**√**	**-**
11	**CS11**	**Contractor**	**-**	**√**	**-**
12	**CS12**	**Public Works**	**-**	**√**	**-**
13	**CS13**	**Consultant**	**-**	**√**	**-**
14	**CS14**	**Public Works**	**-**	**-**	**√**
15	**CS15**	**Planning Agency**	**-**	**-**	**√**
16	**CS16**	**Public Works**	**-**	**-**	**√**
17	**CS17**	**Consultant**	**-**	**-**	**√**
18	**CS18**	**Consultant**	**-**	**-**	**√**
Total respondents			**7**	**6**	**5**

3.3.6.2.4 Expert semi-structured interviews for validation

The expert semi-structured interviews for validation involved interviewing experts in the area of post-disaster reconstruction and road management. This type of interview was aimed at validating and refining the findings of the research. The interviews were conducted in a semi-structured approach, where the questions were posed in order to confirm whether the qualitative analysis of the data successfully captured the phenomena being researched.

Table 3.5 – Profile of respondents for the Expert validation semi-structured interviews

No	*Code*	*Professional Background*
1	***Val01***	***Academic***
2	***Val02***	***Consultant***
3	***Val03***	***Consultant***
4	***Val04***	***Academic***
5	***Val05***	***Consultant***

The interview questions were with regards to the key research findings, grouped into four main categories; general responses of the local governments towards road maintenance, main factors affecting the local governments' performance on road maintenance, post-disaster reconstruction process, safety and security issue in the post-conflict area. These categories were developed based on the findings from the semi-structured interviews with the stakeholders. The selection criteria of the interviewees were based on their experience. The interview guidelines are available in Appendix D.

3.3.6.3 Relevance of the data collection techniques and research objectives

This section aims to elaborate the links between the various data collection techniques (section 3.3.6) and the research objectives (section 3.2.5.2). The main purpose is to demonstrate which of the data collection techniques were relevant and utilised to answer each particular research objectives. The following Table 3.6 summarises their relevance.

Table 3.6 – The Relevance of the Data Collection Techniques and the Research Objectives

Research Objectives	*Literature Review*	*Documents & archives*	*High-level interviews*	*Case study Interviews*	*Expert Interviews*
To explore the road infrastructure reconstruction process, policy and management model in Indonesia at the national and local government level	✓	✓	✓	✓	-
To identify and analyse the obstacles and challenges of road reconstruction in post-disaster context.	✓	✓	✓	✓	-
To analyse the local government's roles in the road infrastructure reconstruction and its capacity on road infrastructure management	✓	✓	✓	✓	✓
To develop a framework for post-disaster reconstruction of road infrastructure	✓	✓	✓	✓	✓

Having described the data collection techniques adopted in the study, the following section will accordingly discuss the data analysis process.

3.3.6.4 Data analysis

Data analysis procedures consist of examining, categorizing, tabulating, testing or otherwise recombining both quantitative and qualitative evidence to address the initial propositions of a study (Yin, 2003). Qualitative data refers to all non-numeric data or data that have not been quantified while quantitative data refer to all numeric data (Saunders et al., 2009). Developing a general strategy for data analysis is essential as it may reduce potential analytic difficulties (Yin, 2003). In accordance with the different data collection techniques employed in this study, there were also a number of steps of data analysis used for this study. Saunders et al., (2009) divide the processes of analysing qualitative data into three types of groups; summarising, categorisation and structuring of meanings, which can be used on their own or in combination.

Prior to making an analysis, the data collected from the interviews were transcribed into written accounts. For the analysis, Computer-Assisted Qualitative Data Analysis Software (CASDAQ) was used as the aiding tool. In this case, the software used was NVivo version 10. Non-verbal

indications seen from the interview process will also be included as additional notes in the respective transcription. According to Saunders et al., (2009), using such software systematically may help establish the continuity and increase both the transparency and methodological rigour. In the next step, the recorded interviews were imported to the NVivo, followed by importing the transcriptions' files which were made earlier using the Microsoft Words 2013. By importing the transcripts onto the recorded interviews, the researcher can easily playback the relevant interview section to confirm and recheck the wordings, tone and mood of the interviewees.

3.3.6.4.1 Content analysis

Content analysis was carried out on the data gathered from the semi-structured interviews. Interview results were transcribed and imported to the NVivo audio files. Transcriptions were then coded on multiple stages approach called open coding, axial coding, and selective coding process. In the open coding process, information from the interviews was coded based on the main ideas of the emerging information. At this phase, any new information was coded into nodes unsystematically. No classification and grouping were done here. This process resulted in hundreds of nodes.

At the later phase, the nodes were then classified and grouped into relevant themes. Up to this stage, the transcriptions were still in the original Indonesian Bahasa language. Since the researcher's mother tongue is Indonesia, same as the interviewees, the transcription and data analysis process was remained in Bahasa. This was done to avoid any loss in of information in the translation process and due to the fact that the researcher feels that he may grasp information better if the data was analysed in his mother tongue. This process is called axial coding.

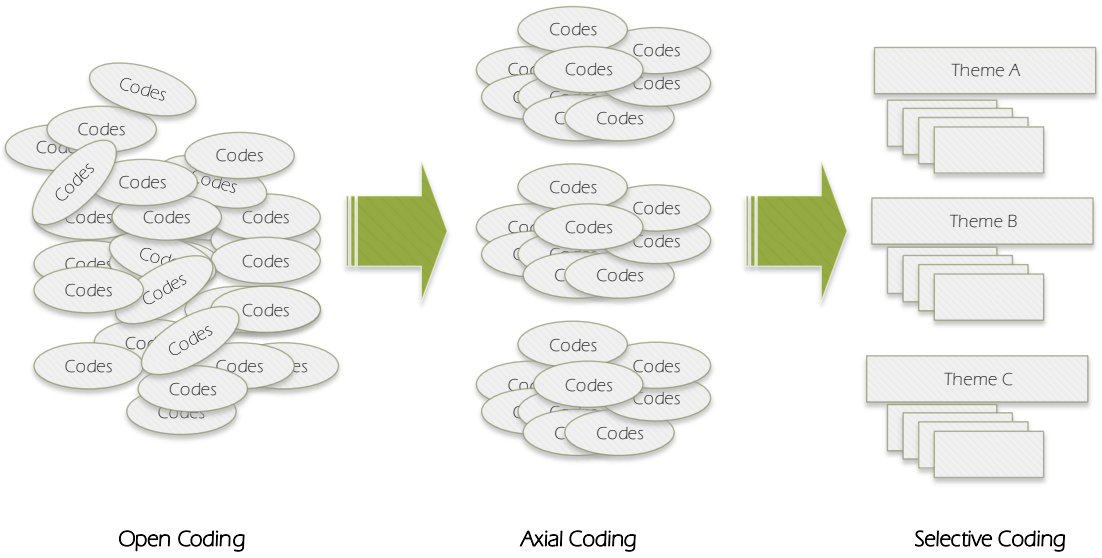


Figure 3.9 – Data Coding Process

Once the axial coding process is finished, the transcription codes were translated into English and were manually exported to Microsoft Word documents for further elaboration and discussions in the form of thesis chapters and sections. In the translation and exporting process, information from the transcription was selected based on its appropriateness and relevance to the themes. Accordingly, this process is called selective coding.

3.3.7 The research onion of this study

Having described and elaborated the various layers of the Saunders Onion, the following Figure 3.10 summarises the research methodology adopted by this study; following the research onion model of Saunders et al., (2009).

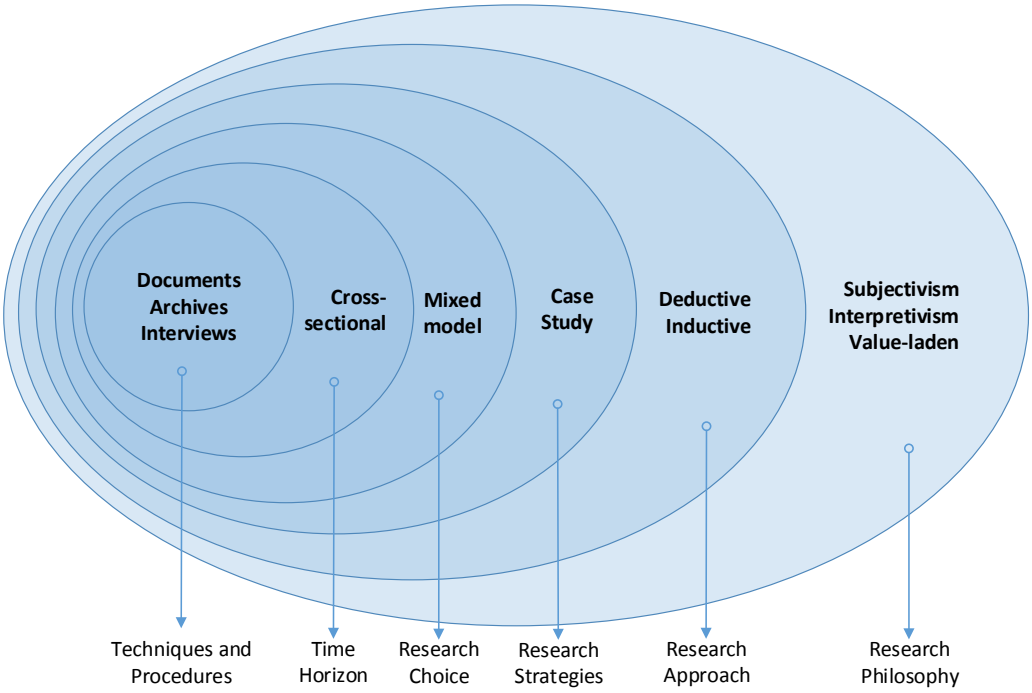


Figure 3.10 – Methodology of this research

Adopted from Saunders' Research Onion

The above figure illustrated the different layers of the Saunders onion, representing the various methods, choices, approaches and strategies adopted for the study in order to answer the research questions. The next section will describe the thesis writing up process.

3.4 Thesis writing up process

The result of this research must be compiled and presented in the form of a thesis. Not only does the thesis keep records of what have been done throughout the PhD journey, it also shows the sequences and the logics behind each research decision. Even though the thesis is produced in the end of the research, the thesis writing up process was started in the very beginning of the PhD journey and was continually conducted throughout the research period.

The above sections have discussed the research philosophical assumptions, approaches, strategies and various data collection techniques adopted in the study. They were presented and discussed to demonstrate and justify the various decisions made in the research. However, in addition to justifying decisions, a research will also need to ensure the quality of the works.

Accordingly, the following section is dedicated to presenting the various techniques adopted in this study in order to maximise the credibility of the research.

3.5 Research credibility

3.5.1 Reliability

According to Saunders et al. (2009) the reliability of a research refers to the extent to which the data collection techniques or analysis procedures adopted in the study will produce consistent findings.

Robson (2002) concludes that the reliability of a research may be threatened by four factors. The four threats represent biases and errors that can be caused by both the subject or participants and the observers. Practically, the four threats to the research reliability are: subject or participant error, subject or participant bias, observer error, and observer bias. The following figure shows the reliability threats in a 2x2 matrix.

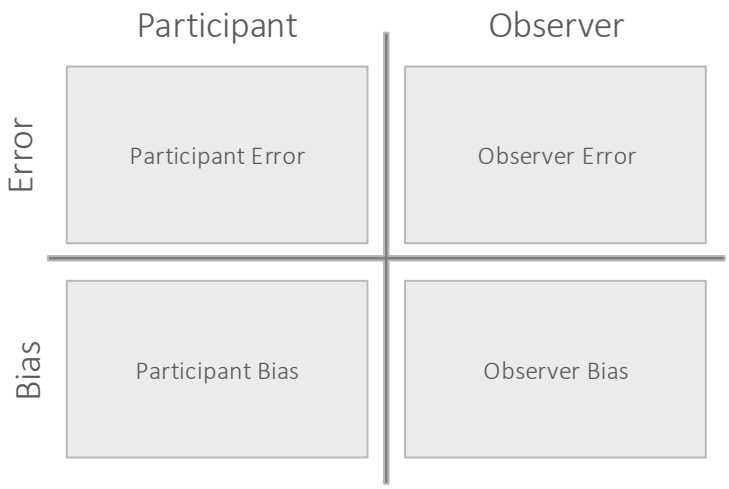


Figure 3.11 – Four Threats to Reliability

Source: Robson (2002)

According to Kirk and Miller (1986), there are three types of reliability; quixotic reliability, synchronic reliability, and the diachronic reliability. The quixotic reliability refers to a circumstance where a single method continually yields unvarying results. In order to achieve the quixotic reliability, the study adopted a multiple case study approach, which is aimed at claiming the literal replication by comparing the findings from the different case studies, as well

as from the different interviewees. The data collection protocols were also tested and consulted with several colleagues and experts in the research area prior to interviewing the respondents. Such a test was conducted in order to ensure that the interview questions are well understood and that the possible responses are in accordance with the researcher's aims of proposing a particular question.

The synchronic reliability, on the other hand, concerns the similarity of outcomes resulting from different observations of similar objects within the same time period. To ensure that the research findings would be synchronically reliable, the study developed a set of case study protocols which describe in detail and in consecutive order the research process. Such protocol is intended to minimise the errors and biases during the data collection process (Amaratunga et al., 2002).

The third type of reliability, the diachronic reliability, relates to the stability of an observation over time. This type of reliability concerns whether the adopted research methodology would yield similar results and remain unchanged over different period of time. This type of reliability is argued to be applicable and appropriate to assess features which relatively remain unchanged over time, such as landmarks and buildings, and is more difficult to achieve with socio-cultural phenomena. The nature of the study, which is a cross-sectional (see section 3.3.5), observes a phenomenon for a particular period of time. Accordingly, the research methodology adopted in the study is not expected, and is not likely, to yield similar findings should it is repeated in a different period of time. This is particularly due to the changes to the observed phenomenon over the period of time.

3.5.2 Validity

According to Easterby-Smith et al. (2002) research validity concerns 'the extent to which the measures and research findings provide accurate representation of the things they supposed to be describing'. Thus, the validity of the research refers to whether the finding statements are 'true'. According to Kirk and Miller (1986), a research is exposed to two types of validity threats. The first type of error is with regard to accepting a statement to be true when it is actually false. The second type of error, on the contrary, is rejecting and assuming a statement to be false when it is actually true. The validity of a research is accordingly affected by various

aspects, such as the impact of the researcher on the settings, the values of the researcher, and the true status of a respondent's account (Silverman, 2009).

Ensuring a validity of a qualitative research is therefore intriguing, particularly when the researcher has the adoption of axiological view in the study; acknowledging the impacts and influences of the different values to the research. However, as Silverman (2009) suggested, there are two forms of validation that can be adopted in a study; triangulation of data and respondent validation. In accordance to Silverman's view, accordingly, the research adopted a multiple case study approach with different data collection methods; documents and archival records, semi-structured interviews which involved a wide range of interview respondents; stakeholders at different government level and from different type of agencies. The findings of the results were compared and contrasted with the literature, and were also validated by the experts on the research subjects with their comments and reviews.

3.5.3 Generalisability

Another aspect of credibility is research generalisability. According to Saunders et al. (2009), generalisability refers to whether the research findings can be equally applicable to other research settings. In other words, generalisability concerns whether the research can be repeated in other organisations, for instance, and can be expected that the similar result would be achieved. Based on the definition, generalisability is therefore probably one of the 'downsides' of a research adopting a case study approach. As highlighted by Amaratunga and Baldry (2001), case study results can be generalised to the theoretical propositions (analytical generalisation) but not to the populations or universe (statistical generalisations). They further add that a case studies research should not be aimed at inferring global findings from a sample to a population but rather to understand and articulate patterns and linkages to the theoretical importance. A similar view is also proposed by Saunders et al. (2009) by suggesting that the purpose of the research adopting a case study approach will not therefore be to produce a theory that is generalisable to all populations. Accordingly, as the case respondents and the case studies were selected based on their relevance to answering the research questions, and were accordingly based on a set of criteria determined by the researcher, the results of the study may therefore be generalised only to areas or events that have similar characteristics and features to the case studies.

3.6 Summary and the link

This chapter has presented a discussion on the research methodology adopted for this study. The discussion includes the various steps and processes involved in the research process. First, the identification and derivation of aim and objectives of the study were presented. The section covers the various steps and phases of the literature review process, leading to the identification of research problems. Second, the methodological design of the research was elaborated. In this section, the philosophical stance of the study was also discussed; including the data collection techniques adopted to answer the research questions. Next, the thesis writing up process has also been elaborated. Finally, the ways in which the credibility of the research, consisting of research reliability, validity and generalizability are assumed were also discussed. In this section, the various credibility measures expected from a research were presented, followed by the credibility measures which were aimed to be achieved by the researcher.

Having discussed in detail the research methodology adopted in this study, the following section is accordingly dedicated to present and discuss the conceptual framework of the study

Chapter - 4 CONCEPTUAL FRAMEWORK

4.1 Introduction

The previous chapter presented the methodological approach of the study. In this chapter, the process adopted in the development of the research conceptual framework will be discussed. The conceptual framework illustrates the key ideas and main subjects which are relevant and significant to the progress of the study, defines the relationship between them, and sets the boundaries within which the research will be conducted. Accordingly, the conceptual framework of the study will be elaborated in this chapter, which will be structured in the following order:

- Firstly, the chapter begins by addressing the needs for establishing the conceptual framework in section 4.2
- Secondly, section 4.3 covers the key issues of the study as identified from the literature review and pilot interviews
- Thirdly, the process of conceptual framework development is presented in section 4.4
- Fourthly, the chapter is concluded by presenting the conceptual framework of the study in section 4.5.

4.2 Why a conceptual framework is needed?

A conceptual framework was described by Miles and Huberman (1999) as a tool to explain, either graphically or in narrative from, the main issues to be studied and the presumed relationship between them. They further suggest that the conceptual framework is fundamental as it specifies who and what, will or will not be studied, and assumes their relationships. Accordingly, the development of the conceptual framework is an essential part of the research process.

The ultimate aim of this research is to build some useful theories to be applicable in the area of road infrastructure maintenance in a post-disaster reconstruction context, using a case study as the research strategy (section 3.3.3). However, as noted by Yin (2003), a good case study research will eventually force the researcher to commence with a set of preliminary theory

related to the topic. Therefore, it confirms the need to pre-establish a theory or conceptualise the phenomenon prior to the data collection and data analysis process.

Accordingly, prior to conducting the case study and interviews with the policy makers and the experts, a conceptual framework was developed, which was driven by the outcomes of the literature review and the pilot interview process. The conceptual framework demonstrates the need to evaluate the capacity of the local government in the maintenance of the post-disaster road infrastructure reconstructed assets.

4.3 Identification of key issues for the development of the conceptual framework

The key areas of the research, emerging from a comprehensive literature review process and the pilot interviews were used for the development of the conceptual framework. Accordingly, the emerging key issues can be listed as (i) the importance of road infrastructure to disaster recovery (section 4.3.1), (ii) post-disaster reconstruction as an opportunity for development (section 4.3.2), (iii) local government roles in disaster management (section 4.3.3), (iv) the national policy on road maintenance (section 4.3.4), (v) the importance of road maintenance (section 4.3.5), (vi) Post-conflict reconstruction (section 4.3.6). Each of these key issues will be discussed in the following sections.

4.3.1 The importance of road infrastructure to disaster recovery

A number of studies have shown that improvement in the road transport infrastructure may provide positive impacts to the community in various ways. As discussed in more detail in section 2.3.1, the improvement in road infrastructure may lead to increased market agglomeration, productivity and labour supply (Crafts, 2009), better trade, communication and economic and social growth, as well as increased international competitiveness (Anapolsky, 2002).

Within the disaster context, a functioning road network plays an important role at all three stages of the disaster cycle; pre-disaster, disaster and post-disaster. In the pre-disaster stage, well-planned road infrastructure may help avoid or minimise the impact of the disaster due to the application of preventive and adaptive design. In the post-disaster emergency and

reconstruction period, Grünewald et al. (2010) suggests that transport disruption into and out of the disaster affected area has been considered a vital constraint to the provision of efficient response in the emergency and post-disaster reconstruction activity. Collapsed road sections and bridges may lead to the distribution of aids and reconstruction materials to the isolated areas by the means of air and water transports, which could result in both prolonged delivery and high operational cost. As Chang et al. (2011) argue, the poor transport infrastructure in Aceh was among the factors that caused an increase in the transportation costs and the construction lead-time, which resulted in the higher construction costs and project delays (for more details, please refer to section 2.3.5 regarding Challenges and obstacles in post-disaster road reconstruction). Furthermore, with regards to the post-conflict areas, the road infrastructure plays a significant role in speeding up the development of the affected areas, which was abandoned and neglected during the conflict (more discussion is presented in section 2.5.7.2 regarding Post-conflict reconstruction and development discourse)

4.3.2 Post-disaster reconstruction as an opportunity for development

Whilst disasters may cause great suffering to people and cause significant setbacks to development, disasters also open a window of opportunity for development in the social, political and environmental aspects (Asgary et al., 2008). The efforts of promoting and implementing the build back better principle can also benefit from the increased political and media attention, which may not be available previously. More detailed discussion regarding the opportunity for development in the post-disaster reconstruction is covered in section 2.2.3.1.

Nevertheless, the extent to which the post-disaster reconstruction can be implemented also depends on the availability of the fund. As discussed in section 2.2.3.2, there are 3 different scenario of fund availability in a post-disaster reconstruction; fund is inadequate to restore the affected areas to their original condition, fund is just adequate, and fund exceeds the amount required to restore the affected areas to their pre-disaster condition. Relating to this issue is the sustainability of the reconstruction assets (section 2.2.3.3) which determines the value of investment made in the reconstruction.

4.3.3 The role of the local government in disaster management

As discussed in section 2.2.4, the importance of the role of the local government in disaster management has been increasingly recognised by disaster management practitioners. Despite the growing recognition, and needs, of the roles of local governments in disaster management, local government capacity in disaster management has, arguably, been inadequate. As de Guzman (2003) argues, disaster management practices in most countries, particularly in the developing world, are more inclined towards managing the responses to disasters (which requires preparedness) rather than managing risks and the underlying conditions that lead to disasters (which among other actions requires risk assessment, vulnerability reduction and capacity enhancement). ISDR further argues that local governments have a crucial role in the disaster-recovery process as it will sustain development once the external stakeholders leave (ISDR, 2010). In a similar fashion, Kusumasari et al., (2010) underlines that local governments play an important role before, during and after the disaster because they know the community very well.

Nevertheless, the capacity of local governments is frequently inadequate and often leads to local government being unable to cope with the problem of overload and is replaced by an improvised emergency government or by the higher level of authorities (Barton, 1970 cited in Wolensky and Wolensky, 1990).

4.3.4 National policy on road maintenance

Other key issues identified in the study are with regards to the national policy on the road management aspect. The level of government and road management authority responsible for the maintenance of the road infrastructure greatly determines the road infrastructure condition, particularly due to the different level of capacity that each of the government has, as well as the institutional arrangement between the different levels of authorities. As described in detail in section 2.5.3.2 of chapter 2, in the decentralised government system, the local government and the respective local road authorities bear the main responsibilities and authorities for the management of most of the road infrastructure networks. As also highlighted by Robinson and Stiedl (2003), the benefit of having a decentralised road management system in developing countries can only be assured through a long-term

investment in establishing an effective system at the local level and building the local capacity. Donnges et al. (2007) argue that such condition result from the lack of efforts to ensure that the local authorities possess the knowledge and skills to effectively deal with the road maintenance during the decentralisation process. They further argue that the existence of appropriate capacity is the key to the effective implementation of road maintenance, on top of the existence of the political will, changed attitude, and the financial availability.

4.3.5 The importance of road infrastructure maintenance

Improved road infrastructure may offer significant benefits to the road users through the provision of improved access, comfort, and lower vehicle operating cost (Burningham and Stankevich, 2005). However, to obtain the long-term impacts of the road improvement, a well-planned maintenance program is required otherwise the design-life may not be reached, and the investment may not yield the expected value (more details are discussed in section 2.4.1). As highlighted by Martinez (2001), road deterioration may lead to at least three important consequences; increase in vehicle operating cost, increase in investment cost, increase in the number of accidents.

Even though road pavements are generally designed to last to 20-40 years, there are a number of factors affecting the pavement performance which determines pavement design life and the needs for maintenance. Additionally, the designed life of road infrastructure is described assuming that proper road maintenance works are carried out when they are required. However, road deterioration does not immediately occur in the early years of completion. According to Harral and Faiz (1988), typically two-thirds of the pavement deterioration problems take place in the final third of the pavement design life. Within the first two-third of the period, also called as the grace period, road pavement may survive even without maintenance; after which road maintenance needs may surge dramatically. Within the grace period, typically the initial four to five years of road construction, road may not show any deterioration at all. Nevertheless, this fact could be misleading as people may get too focused on the roughness of the road surface and ignore the actual structures which help achieve or maintain the road roughness over time which failures are not immediately visible.

4.3.6 Post-conflict reconstruction

In a post-conflict reconstruction, early engagements of stakeholders, clear roles and responsibilities between institutional organisations and a "truly" joint planning between the national counterparts and donors are the key lessons learned to successful post-conflict reconstruction (Rohland and Cliffe, 2002). It is also suggested that the reconstruction design and implementation phase should well consider finding the right balance between building human and institutional capacity and the management of emergency rehabilitation and services. Furthermore, "the use of community-driven approach, non-governmental and private sector capacities, as well as a prompt response to building procurement and payment systems are argued to help accelerate reconstruction and service delivery.

Nevertheless, Billon and Waizenegger (2007) confirm that the pre-disaster political trends have a significant impact on the post-disaster conflict outcomes and that the spatiality of conflicts and disaster as well as the post-disaster condition of governable spaces and public discourse determine the political fallouts of the tsunami in Aceh and Sri Lanka. It is also argued that the historical hostility experienced by a nation has a strong influence to the current stage of ethno-political conflict, which ultimately hinders the process of nation building. With regards to political fallouts of disaster, Imtiyaz and Stavis (2008) also suggest that disaster may result in political changes and that the pre-disaster context and the trends of politics largely determine the political fallouts of disasters. They further added that with regards to conflict transformation, disasters accelerate and amplify the pre-disaster social and political dynamics, rather than providing a 'new departure' as a result of the devastating impact of disasters. Additionally, Billon and Waizenegger (2007) also conclude that disaster may provide an opportunity for peace building due to changes in the value structure among survivors, the mutual needs for relief assistance, enhanced local political socialisation and mobilisation, as well as international involvement and disaster diplomacy. On the other hand, conflict can also greatly adverse the growth of political, social and economic institutions which impacts affect the economies in the post-conflict period (World Bank, 2009a).

The identified key issues, as discussed in sections 4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.4, and 4.3.6 above were then incorporated into the conceptual framework. The process of conceptual

framework development will be discussed in the following section. However, the initial conceptual framework would be refined as the research progressed.

4.4 Development of the conceptual framework

This section covers the process of the development of the conceptual framework. The development of the conceptual framework was initiated by identifying the key issues of the study resulting from the literature review process. Following this process, the identified key issues were further refined in the second phase of literature review and used as input and guidelines for the pilot interviews. The process was later followed by the refining the boundaries of the study, the key concepts, and the interrelationship between them. The process of the conceptual framework development is illustrated in Figure 4.1, and the resulting conceptual framework is illustrated in Figure 4.2.

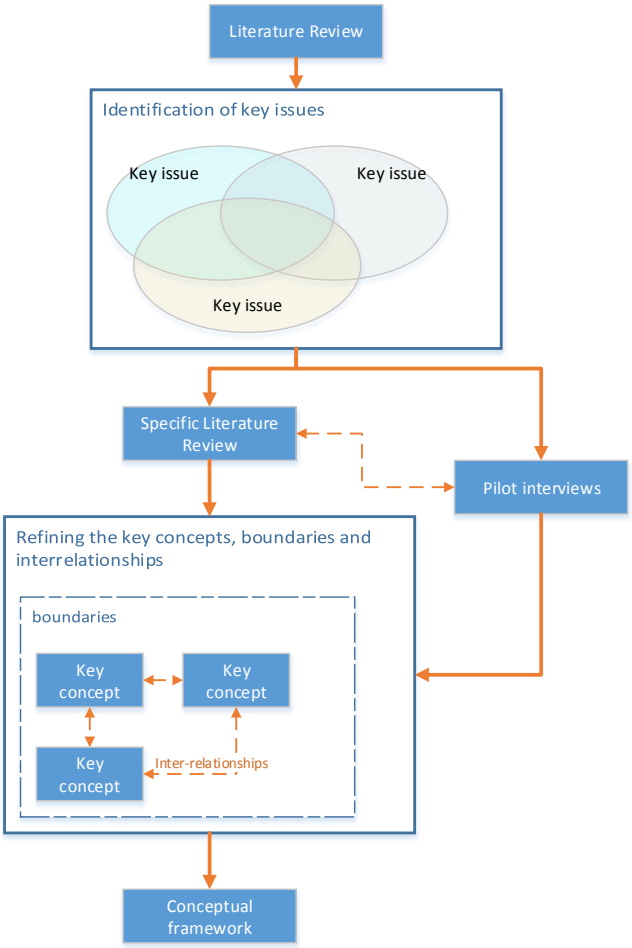


Figure 4.1 – Development of Conceptual framework

The following sections elaborate how the key issues lead to the process of key concept identification and definition of the boundaries, as well as the inter-relationship between them.

4.4.1 Key concepts

As a result of the literature review process, the identified key issues of the research were further refined through specific literature review and pilot interview process. As discussed in section 3.2.3, the pilot interviews underline the concerns regarding the sustainability of the road infrastructure reconstruction assets. Particular emphasises were further addressed to the capacity of the local governments in road maintenance who bear the greatest responsibility to maintain the infrastructure in the decentralised government system. The respondents also highlight the lack of awareness of the local government towards the importance of maintenance and further suggest identifying the underlying problems.

Accordingly, the key concepts for the development of the conceptual framework are therefore the road reconstruction process, the involvement of the local government in the road reconstruction process, and factors affecting local governments' capacity in road maintenance. Additionally, the impact of the post-conflict is also considered as one of the key concepts. Having identified the key concepts of the conceptual framework, the following sections will describe the relationship between the identified concepts.

4.4.2 Interrelationships between key concepts

Having presented the key concepts of the conceptual framework, this section will elaborate the relationship between them. This research merges two major areas; the disaster management and the road infrastructure maintenance. Both subjects are connected by the need to restore and improve the road infrastructure condition damaged by the disaster. This is particularly due to the life cycle of the road infrastructure, which spans between two periods of time; the planning, procurement, and the construction processes which take place during the disaster recovery period, and the operation and maintenance processes which take place in the post-reconstruction period.

Due to the inadequate capacity of the affected local governments to take the lead to restore the damaged road infrastructure, the road reconstruction activities were performed by the

national government and donor agencies. Since the local governments are held responsible for the long-term maintenance needs, there is accordingly a need to explore the involvement of the local government in the road reconstruction process as one of the main stakeholders of the road infrastructure.

Furthermore, after completion, the reconstructed road assets were handed-over to the local governments for the operation and maintenance. Since the maintenance capacity of the local governments has been renowned to be limited, the research highlights the need to evaluate the capacity of the local governments in the maintenance of the post-disaster road reconstruction assets and identify the underlying problems of the road maintenance issue, which will be linked back to the post-disaster reconstruction process. These issues eventually demonstrate the interrelationship between the key concepts. The contributions that each of these key concepts provides to the capacity of the local government in maintaining the post-disaster road reconstruction assets are illustrated in the conceptual framework.

4.4.3 Boundaries

Once the key concepts and the relationship between them have been identified, the conceptual framework requires a clear definition of the research boundaries. The specific literature review and pilot interviews suggest that unlike the normal development process, post-disaster reconstruction frequently engages great scale and rapid reconstruction activities. Also, assuming the fund is sufficient, post-disaster reconstruction would also be used as an opportunity for the physical, social, political, and the environmental development such as better road construction and the expansion of the road networks, which is aimed to reduce isolation and improve the economic condition (section 2.2.3.1). Nevertheless, the literature suggests that the road infrastructures in the developing countries suffer from rapid deterioration and loss of investment, due to the lack of maintenance. A study of Harral and Faiz (1988) regarding the road maintenance in 85 countries concludes that as much as $45 billion worth of investment in the road infrastructure could have been saved by a provision of less than $12 billion of preventive maintenance. Another study confirms that the rehabilitation of a paved road after 15 years of lack of maintenance may cost as much as $200,000 per km, whilst the provision of regular maintenance for the 15-year period will only cost as much $60,000 per km (Heggie, 1996).

In the event of the earthquake and tsunami on December 26th 2004, twelve countries were affected by the disaster. In Indonesia, the province of Aceh was the most devastated area. From the road infrastructure perspective, more than 3600 km of road networks were reconstructed. This condition raised a concern over the maintenance of the extensive reconstruction assets. Accordingly, the boundary of the research was defined as the post-disaster reconstruction of road infrastructure in the Province of Aceh, Indonesia. In addition, this study is particularly focused on the road maintenance at the district level, as most of the roads are under the responsibility of the local governments. However, as Aceh province underwent a conflict for almost 30 years prior to the tsunami, the impact of conflict is also considered as an additional boundary of the research. Additionally, it is worth noting that this study is conducted under the sponsorship of the local government of Aceh province. Hence, the result of this study is expected to have a direct contribution to the development of Aceh province. Among other factors, this has also been the justification for selecting the maintenance of road infrastructure in Aceh as the main focus of this study.

4.5 Conceptual framework

The established conceptual framework, as presented in Figure 4.2, is developed by comprehensively consider the key concepts, the interrelationship between the key concepts, and is constrained by the research boundaries as discussed in section 4.4.3 above. As the research is progressing to the data collection and data analysis process, the conceptual framework is subjected to further refinement, in order to accommodate and reflect the research findings.

4.6 Summary and the link

This section has presented the conceptual framework of the study. The process of conceptual framework development was initiated with the identification of key issues, followed by fine-tuning the key issues into key concepts through specific literature and pilot interview process, and defining the interrelationship of the key concepts and the research boundaries. The established conceptual framework illustrates the various aspects which act as the key affecting and enabling environment to the successful post-disaster reconstruction. Furthermore, the conceptual framework also displays the various subjects integrated into the post-disaster

reconstruction of the road infrastructure, within which the key issues and concepts need to be further observed. At the later stage, the framework demonstrates and links these issues to the resulting capacity of the local government in road maintenance. Having developed the conceptual framework, the next chapter is dedicated to presenting the analysis of data collected from the case studies.

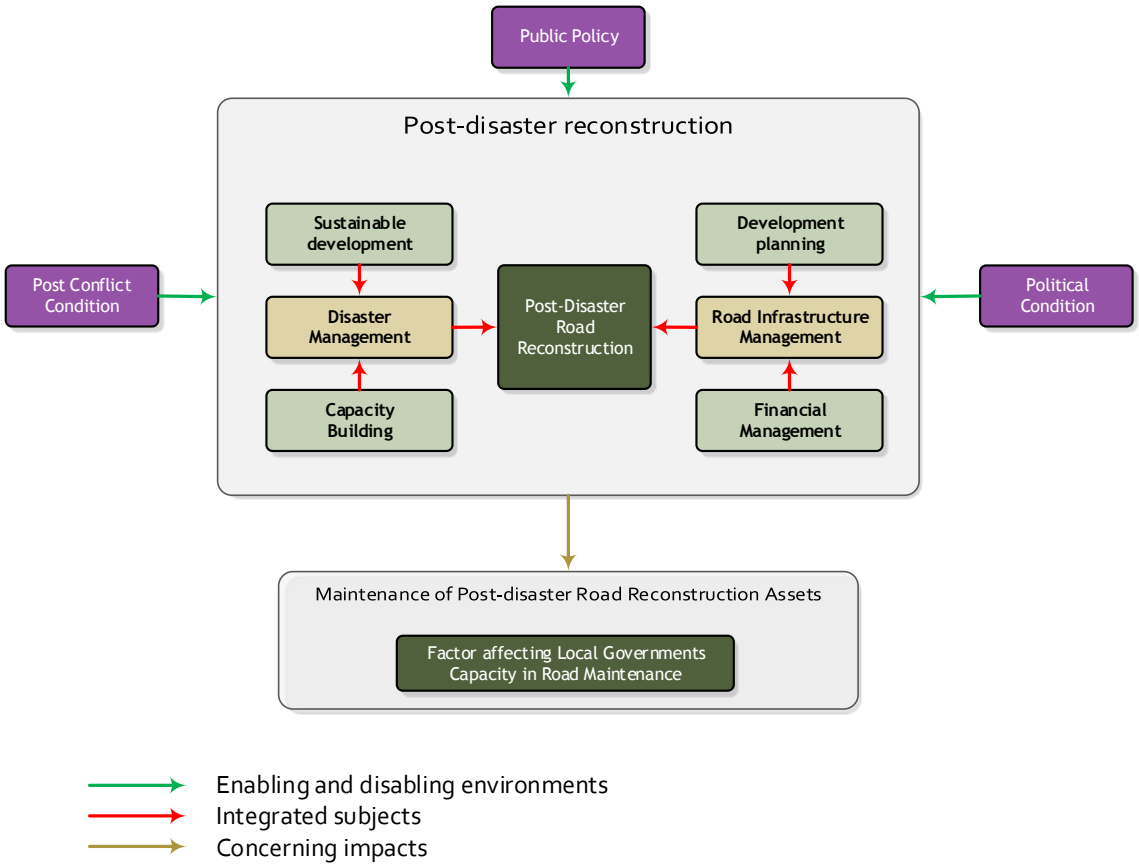


Figure 4.2 – Conceptual Framework of the study

Chapter - 5 DATA ANALYSIS

5.1 Introduction

Chapter 4 presented the conceptual framework of the study which provides and defines the boundary of the research. This chapter elaborates the data analysis of three types of semi-structured interviews conducted in the study; the high-level interviews, case-study interviews, and the expert validation interviews. The chapter is divided into four sections, as described in the following.

- Section A is dedicated to present the analysis of the semi-structured interviews conducted with the high-level officials and policy makers at the provincial and the national level.
- Section B will provide the analysis of the three case studies.
- Section C will accordingly present the cross-case analysis of the case-studies. In this section, the results of the case-study will be compared and contrasted.
- Section D validates the findings of the study with the experts in the area of disaster management and road infrastructure maintenance.

Having presented and discussed the four main sections of the chapter, a summary of the empirical analysis will be provided.

SECTION A – HIGH LEVEL SEMI-STRUCTURED INTERVIEWS

5.2 Background information of the high-level interviews.

This section is focused on presenting the analysis resulted from the semi-structured interviews conducted with the high-level officials and policy makers. As described in 3.3.6.2.2, ten respondents were interviewed, representing the disaster management agency, the planning agency, the public works, and donor organisations. The interviews were aimed at capturing the respondents' perceptions on the main issues of the reconstruction and the maintenance of road infrastructure. Particular focus was also addressed at the involvement and roles of the

local governments in the post-disaster reconstruction in Aceh, with regards to the maintenance of the road infrastructure. Accordingly, the discussions will be grouped into two main categories: the local government road maintenance capacity and the links to post-disaster road reconstruction.

5.3 Procedures adopted in analysing the high-level semi-structured interviews.

The local governments' capacity in the maintenance of the road infrastructure at the local level and the link with the post-disaster reconstruction process were explored through interviewing ten high-level officials and policy maker respondents using semi-structured interview approach. All ten respondents were also involved in the post-disaster reconstruction in Aceh. The purpose of having the high-level interviews was to explore and contextualise the road reconstruction and maintenance initiatives at the local level from the policy makers' perspective. Accordingly, the respondents' perspectives and experiences in the reconstruction of the road infrastructure in Aceh were explored to obtain hindsight into the road reconstruction process.

The data gathered from the interviews was coded using NVivo (version 10) followed by the development of cognitive maps using the aid of the same software. Cognitive maps are presented to assist with understanding the connections and relationships between main factors. The coding structure of the analysis is presented in Figure 5.2, Figure 5.5, and Figure 5.7 with respect to the main issues analysed. The cognitive maps for the high-level semi-structured interviews are accordingly presented in Figure 5.4, Figure 5.6, and Figure 5.8. The generic cognitive map and the meaning of each box is illustrated in Figure 5.1

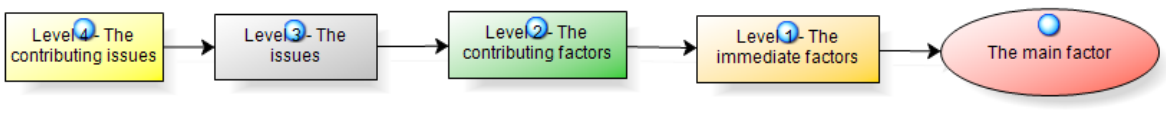


Figure 5.1 – The generic model of the cognitive map

As the procedure of analysing the data has been discussed, the following section will accordingly analyse and present the findings from the semi-structured interviews with the high-

level officials and policy makers, which will be further subdivided into two discussion topics, Local Governments road maintenance capacity in section 5.4.1 and Links to post-disaster reconstruction in section 5.4.2.

5.4 Analysis of high-level interviews

5.4.1 Local Governments road maintenance capacity

In this section, the respondents' perceptions and experiences with regards to the capacity of the local government in road maintenance were explored. As with the capacity issue, the interviews resulted in the discussion of two major areas; the main factors affecting the capacity of the local government in maintaining the road infrastructure, and the capacity building in road maintenance. Accordingly, the analysis will commence with exploring the main factors, initiated with the discussion of the external factors.

5.4.1.1 The main affecting factors

5.4.1.1.1 External factors

The external factors of the road maintenance capacity are those which are outside the direct control of the road authorities and somehow constrain the way they may operate. As the external factors are beyond the authority of the road agency, they are essential in enabling a supporting work environment for the local governments in performing the road maintenance tasks.

The external factors of road maintenance consist of several groups of issues, as shown in the following figure from the NVivo snapshot. The groups of issues are legal and regulatory, political, socioeconomic, and inter-organisational relationship. Each of these issues will be presented in separate sections.

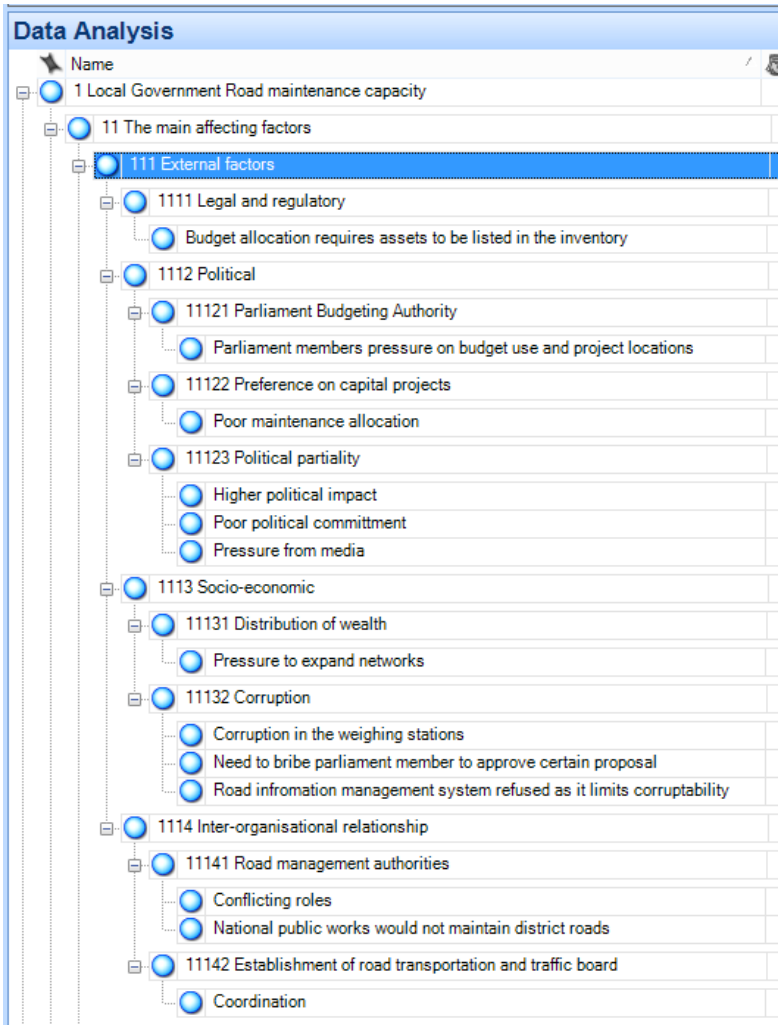


Figure 5.2 – The coding structure for the external factors in road maintenance capacity

5.4.1.1.1.1 Legal and regulatory

The legal and regulatory aspect of the road maintenance capacity covers laws and regulation that provide the basis and work environment for the road authority. This includes laws and regulation regarding the organisational structure and inter-organisational relationship between authorities involved in the road maintenance, as well as the financial and budgeting procedure.

The Indonesian government has issued several laws and regulations regarding the road maintenance financial arrangement. Government Regulation no 34/2006 (Government Regulation, 2006) article 57, describes that the national government is responsible for the management of national roads and that the provincial and district governments are responsible for the provincial and district roads. Additionally, as described in article 59 of the regulation,

part of the authority to manage the national road networks can be transferred to the provincial government based on the "co-administration" principle. According to the regulation, each of the government levels are therefore responsible for the development of roads under their authority. The road development tasks include programming and budgeting, technical planning, land acquisition, construction, and operation and maintenance (Government Regulation, 2006, article 83). Article 85 of the regulation further stipulates that in the case that the regional governments cannot afford to allocate sufficient fund for the road development, the national government may provide assistance. However, the elucidation of the regulation no 34/2006 article 85 describes that the regional governments are considered unable to fund the road development if they have allocated at least 20% of the total annual budget for maintaining and upgrading road infrastructure but still unable to meet the minimum road service standard.

Furthermore, the provision of assistance to the regional governments by the national government is implemented through the allocation of Specific Grant Allocation (DAK). The DAK is a grant provided by the national government to the regional governments for specific purposes only, which are authorised by the ministry of finance, and detailed by the respective line ministries. For the road sector, the use of the allocation is detailed by the ministry of public works (MPW) in the form of ministerial regulations, such as Regulation of MPW no. 39/PRT/M/2006 and Regulation of MPW no. No. 42/PRT/M/2007 regarding the technical guidance on the use of Specific Grant Allocation (DAK) for the infrastructure sector. These ministerial regulations have been replaced by the newer Regulation of MPW no 15/PRT/M/2010 on the same subject. According to the regulation of MPW no 15/PRT/M/2010 article 10, for the road sector, the DAK fund can only be used for periodic maintenance, rehabilitation and surface upgrade, as well as for completing the construction of a road section. It further explained that road sections which can be included in DAK-funded projects are those that have been registered or in the process of registration as district roads by a Bupati decree.

In addition to laws and regulations describing the specific use of the DAK, the ministry of Home Affairs also issued a regulation regarding asset management. The Regulation of Ministry for Home Affairs no 17/2007 (Regulation of MoHA, 2007) article 7 describes that the maintenance needs should be included in the work plan of the related regional agencies, based on the list of

asset inventory. The maintenance needs will later be used as one input for the annual budget needs. Article 9 of the regulation further explains that upon the approval of the annual budget, the asset management agency will then prepare the list of maintenance needs for the maintenance work implementation.

In the post-disaster reconstruction process, these regulations appeared to be the main reason for asset transfer refusal and asset maintenance neglect. Most of the reconstruction of road infrastructure in the post-disaster reconstruction period was implemented by BRR and donor agencies. All of the BRR projects, and any donor projects which were listed and included in the National Budget must be registered as the national assets prior to transferring back to the regional government as a grant (Regulation of MoF, 2008). Once the asset transfer process completed, the asset ownership, as well as the maintenance responsibility, would be held by the recipient governments. However, as the transfer of asset experienced delays, the road maintenance needs were neglected as the Local Governments did not allocate the maintenance needs in their budget. The problem was highlighted by PM07 by stating that assets that are not recorded in the district governments' list of inventories could not receive budget allocation. A similar comment was expressed by PM03, by saying

> *"The district annual budget can only allocate funds for the OP, operation and maintenance, if it had been listed as the district's asset" – PM03*

As a result, the delays in the asset transfer process resulted in road sections being abandoned and that no maintenance needs were provided. More discussion on this issue will be presented in section 5.4.2.3 regarding the asset transfer.

5.4.1.1.1.2 Political

Another external factor affecting the road maintenance capacity is with regards to the political aspect. In the process of post-disaster road infrastructure reconstruction and in the road infrastructure maintenance, political pressure seems to be a highly influential factor and was experienced coming from different directions. As PM02 highlighted

> *"The politics, the political pressure came from various angles… if there were unsatisfied parties, then it would (be problematic). They would say that the BRR was not absorbing aspirations, not being sensitive to the community background." – PM02*

According to Law 27/2009 (Law, 2009b) article 341, the local parliament consists of members of political party registered in the election and was selected through the election. Additionally, due to the special autonomy status and the peace agreement between the government of Indonesia and GAM, Aceh was given a privilege to establish local political party for the provincial and local level, as stipulated in Law 11/2006 (Law, 2006) chapter XI article 75. The following section will accordingly discuss the impacts of the political condition to the road maintenance.

Parliament budgeting authority

In the decentralised system of Indonesia, the parliament has the budgeting authority. According to Law no 27/2009 (Law, 2009b) article 343, the local parliament has three main functions, namely legislation, budgeting and the monitoring of law and budget allocation implementation. Article 344 of the same Law further explains that the parliament has the obligation and authority to discuss and approve the draft of the budget proposal submitted by the local governments.

Moreover, due to the decentralised system in Indonesia, the political pressure is widely experienced. This was argued to be particularly affected by the direct election system of the head of regional governments as well as the parliament members. The parliament members are directly elected by the community in the election. Accordingly, in addition to being registered and promoted by a political party, the parliament members would therefore need to deliver the political campaign of their political party and at the same time need to make themselves electable by conducting an individual campaign by creating political programs and agendas to the community. Once elected, such political programs and agendas would ideally be translated into producing legislations and approving budget proposals and development programs that reflect and help realise their campaign and promises.

However, in order to fulfil their political programs and promises, parliament members would therefore intervene the projects and programs proposed by the Local Governments. This condition was experienced widely. As PM01 described, even at the national level, the national parliament member would also put pressure on the development at the regional level, demanding that their hometown district to receive more development programs than the others. PM01 said

"Actually, the political pressure was very strong… How was the pressure? The parliament members come from certain districts… so the pressure is that they want the development in their districts to be larger than other districts." – PM01

In addition to the issues related to the budgeting authority of the parliament, the higher political preference on capital projects also hinders the road maintenance efforts. More discussion will be presented in the following section.

High preference on capital projects

Another issue which is commonly experienced in the discussion of road maintenance is the politically and technically higher preference on the capital projects compared to the maintenance intervention works. ADB (2003) highlights that the value of the project, the relatively more sophisticated level of the work, and the immediate impact of a capital project is more politically and technically interesting for the politicians, as well as for the road engineers.

Additionally, the post-disaster reconstruction activities have reconstructed more than 3600km of road networks all over Aceh and Nias, around 1000km more than what was destroyed. The extensive road reconstruction activities apparently reduced the maintenance backlog and improve the overall road condition. However, the preference of the politicians, and also the road authorities over the capital project unfortunately and potentially lead to wasted and unnecessary investment. For instance, the newly established district of Pidie Jaya; located in the eastern coast of Aceh, recently built an 800m long, four-lane flyover bridge which cost them more than Rp 76 billion. The necessity to build the flyover bridge was questioned as it was built over active rice paddy fields, in the capital city of the district which has a population of 18,000 people and an area of 127 km^2; a population density of around 140 people/km^2 (BPS Pidie Jaya, 2012). PM06 argued that the project was unnecessary and was a consequence of the high preference of the Local Governments and politicians on capital and monumental project.

"Eventually, there would emerge programs or activities which are monumental, and are not actually fundamental. Just to build something big, the benefit is not so (big), but also needs quite a large of investment. For example… the flyover in Pidie Jaya. It was not supposed to be built, but was built." – PM06

He further added that the Local Governments seem to not have considered the long term requirement of the project and also suggested that such poor development project was a consequence of the mind-set of those involved in the development planning. As he further said

> *"In the end, it adds burdens to the provincial government. When bad things happen, they will write to the provincial government, please help (maintain) because our budget (the LG) has run out." – PM06*

Another main point emerged from the interview was that at the national level the maintenance of road infrastructure gets a higher priority. The national government recognises the wide impact of poorly maintained roads to the economy. However, it was suggested that this view was not well grasped by the regional governments. At the regional level, the maintenance of roads seemed to get low priority. PM06 argued that the number of unpaved road sections, combined with the contract value of new road construction projects, resulted in the high preference over road construction projects than the maintenance interventions. He said

> *"Maintenance is not considered a priority. Why? Because there are still many other roads which have not been paved… The budget allocation for the construction is also not small. So it is considered that the priority should be there (for the construction)." – PM06*

In addition to development programs having to be prepared according to the parliament's demand, the political pressure gradually decreased the budget allocation for road maintenance. As explained by PM06, he was concerned that eventually there would be nothing left in the budget for the road maintenance needs. As he said

> *"This is what I have been observing. Since the discussion of budget takes place in several locations (in the government and parliament), occasionally the budget allocation for maintenance, which we have allocated for a certain sum, is gradually cut. I am afraid that it will eventually be gone." – PM06*

As PM06 further explained, the Planning Agency (Bappeda) will normally propose a certain amount of budget allocation for the maintenance of the road infrastructure. However, the decision on the final budget allocation will eventually be determined between the government and the parliament in the budget discussion session. Since the maintenance needs frequently get lower priority, the budget allocation discussion often resulted in the postponement of

maintenance works to the later year, as an excuse to the limited budget availability in the running year and due to competition with other sectors. PM06 further emphasises his worry on this issue,

> *"What we are afraid of is that they (the maintenance works) would be postponed to next year, but it may be suddenly gone (deleted)." – PM06*

Political partiality

Another issue emerging from the interviews was that the political partiality was one of the main affecting factors in the process of road maintenance decision making. To better illustrate this issue, it is necessary to present a statement from PM08 regarding the political pressure for maintenance allocation. PM08 articulated his confusion on the Local Governments' justification and excuses for not providing the maintenance fund for the post-disaster road reconstruction assets which was based on two different occasions.

First, for the foreign-funded district road projects, Local Governments' acceptance and willingness to provide the maintenance fund after project completion was agreed in the form of MoU between BRR and the respective Local Governments (please refer to section 5.4.2.2 regarding Consideration of maintenance). Second, as previously discussed in the section 5.4.1.1.1.1 above, the Local Governments also refused to maintain the road reconstruction asset before the legal documentation was completed and that the road assets had been formally transferred to the Local Governments.

However, the two occasions were contradictory as the Local Governments and the parliament were in fact able to provide the maintenance fund of the following first year of the foreign-funded projects despite the incomplete asset transfer process. However, the maintenance allocation for the second year, conversely, was immediately rejected by the parliament. PM08 said

> *"With regards to the funding (for the road maintenance needs) of the first year, I do not know how, but somehow they managed to provide it. But for the second year, the parliament immediately blocked it." – PM08*

The two occasions reveal that the political willingness plays a greater role in determining budget allocation for maintenance. This was suggested by PM02

> *"Formally, the Local Governments cannot allocate maintenance needs if the formality (asset transfer) is not done yet, even though actually (with) governor discretion it can be done, if they are brave. However, the nature of politic does not work that way." – PM02*

The discretion meant by PM02 is that the governor might actually issue an instruction to provide allocation for the maintenance of road assets accepted from the third party as grants, as stipulated in the Regulation of Ministry of Home Affairs no 17/2007 article 19. However, since it may provoke political disputes, the regional government chose not to exercise that authority.

5.4.1.1.1.3 Socioeconomic

In addition to the legal and regulatory and the political issues affecting the Local Governments capacity on road maintenance, socioeconomic challenges seemed to be one of the biggest factors that drove the decision-making process.

Distribution of wealth

Another interviewee also expressed that there had been a dilemmatic position with regard to distributing wealth (expanding road networks) and setting up development priority principle (maintaining existing networks) which had been commonly experienced in development planning.

However, PM01 argued that development of an area is still required even though the Local Governments are known to be incapable of maintaining the assets in the future. As he argued

> *"The argument will be, if the Local Governments is not capable, not able to maintain, then there should be no development in the area? I choose to use the development equality approach. Hence, I will still need to build, even though they cannot maintain" – PM01.*

As also suggested by PM06, the maintenance needs did not get high priorities as the need to expand to road networks was considered to be more urgent. As most of the road networks at

the local level had not been paved, road network expansion was deemed very important to distribute wealth and to stimulate the economic growth.

The respondents' comments on the socioeconomic factors in the road maintenance have presented an insight and background into why maintenance of road infrastructure gets a lower priority when compared with the construction of new roads resulting from the high social pressure in development to distribute wealth and reduce the number of isolated area. In addition to the distribution of wealth, corruption was also argued to have affected the road maintenance efforts.

Corruption

Corruption has been a big problem in Indonesia. The Transparency International report on global corruption perception listed Indonesia as the 114 out of the 117 countries surveyed in its 2013 report (Transparency International, 2013). This was also seen to be one of the root problems of road maintenance.

Additionally, corruption problem was also experienced in the traffic loading control. The department of transportation was responsible for performing this task. The traffic loading control was particularly done by the means of using the weighing stations. According to the regulation, the passing trucks will need to get on the weighing stations and any excess loading will need to be removed. However, the traffic loading control cannot be enforced due to the corruption issue on the side of the weighing stations' operator. As PM10 expressed

> *"As I said earlier, it's a 'vicious circle' (complex problem)… So the problem (can be solved) if the operator work soundly and firmly. And that also related with the law enforcement that needs to be implemented on the site, which has become a public secret, the illegal extortion" – PM10*

PM10 further described how working as one of the weighing stations' operators has been one of the most favourite positions among the employees of the transportation agency due to its corruptibility. However, this phenomenon was not only experienced in Aceh, but seemed to be a national phenomenon. As PM10 further suggested

"All over Indonesia. All over Indonesia the weighing stations (operators) have been the favourite position for those who wants to do little works with big money. All over Indonesia, not only in Aceh. I have been travelling around, meeting with other department of transportation personnel from all over Indonesia, the weighing station is the most favourite post." – PM10

Another corruption issue emerging from the interview was raised by PM01. Interviewee PM01 described how the issue of corruption affected the decision-making process with regard to the road maintenance and the road management in general.

Particularly addressed to the development of the road information management system, he argued that the idea to develop a proper GIS-based system for road maintenance had been proposed and initiated during the post-disaster reconstruction period. He argued that such system will allow the road authorities to provide a strong basis to justify the maintenance needs. In turn, this would also help road authorities to justify their budget proposal, by presenting informed consent options to the parliament, without having to fight and bribe the parliament. As he said

"If we can develop that (system)… we do not have to bribe or other sort of things, which is commonly practiced until now." – PM01

Regardless the benefit of adopting such a system, however, he later explained that the proposal for development and utilisation of the road information management system was rejected by the Local Governments, accusing that it was based on the reduced chances and gaps for corruption. He said

"The system was offered to the public works, but they did not want to adopt it… if they used it, they could not play around. They preferred to play around with the parliament." – PM01

This section has elaborated the corruption issue surrounding the Local Governments' activities on road maintenance. Accordingly, the section will continue to discuss the safety and security aspect as one of the main contributing factors affecting the Local Governments' road maintenance capacity.

5.4.1.1.1.4 Inter-organisational relationship

The next external factors affecting the maintenance capacity of the local governments are with regards to the inter-organisational relationship. Inter-organisational relationship refers to the relationship between government or private institutions and other stakeholders of the road infrastructure. From the discussion with the provincial and national representatives, two main issue emerged regarding the inter-organisational relationship namely the road management authorities and the establishment of road transportation and traffic board.

The road management authorities

With regards to the road management, the authorities and responsibility on road management and road transportation are distributed vertically between different levels of government agencies as well as horizontally between different departments at the same government level. According to Government Regulation no 34/2006 article 25, the vertical distribution of road authority means that the national road is managed by the national government, the provincial road is managed by the provincial government, and the district road is accordingly managed by the district government.

Whilst the vertical distribution separates and classifies roads according to their level of ownership; national, provincial and district road, and therefore each road section is owned by one particular government level, the horizontal distribution means that there are more than one authorities responsible for certain tasks of the road management in each road section.

According to law no 22/2009 (Law, 2009a), there are five government institutions involved in the road and traffic management. As stipulated in article 5 paragraph 3, the responsibility and authority related to the management of road and road traffic are distributed as the following

- Road matters are under the responsibility of the ministry responsible for the road sector
- Transportation and traffic infrastructure and facilities are under the responsibility of the ministry responsible for the transportation and traffic infrastructure and facilities
- Transportation and traffic Industrial development are under the responsibility of the ministry responsible for the industry

- Transportation and traffic technology development are under the responsibility of the ministry responsible for the development of technology
- Motor vehicle and driver registration and identification, law enforcement, operational management and traffic management and traffic education are under the responsibility of the police force.

Apart from the police force, the ministries responsible for the first four tasks are not explicitly stipulated in the law. This is particularly due to the frequently changing names of the ministries with little or no changes in the authority and responsibility, and that the regional government may have different names for similar agencies. Nevertheless, as in 2014, at the national level these ministries are consecutively the ministry of public works, ministry of transportation, ministry of industry and ministry of research and technology.

The above arrangement is designed for the ministerial level, i.e. for the national level. Due to the autonomous region system, the regional governments may therefore establish their own agencies. Accordingly, at the district level, the distribution of authority on road transportation and traffic needs to be adjusted and synchronised with the organisational structure at the local level. For instance, the institution responsible for the industry in Banda Aceh is combined with the trade, cooperative and SMEs affairs. Hence, the name is the Agency for Industry, trade, cooperative and SMEs. Another example is with regards to the transportation agency. In Aceh Barat Daya, the agency is combined with communication and information hence the name is called the Agency for transportation, communication and information. Detailed information on the tasks of these agencies is presented in Figure 5.3.

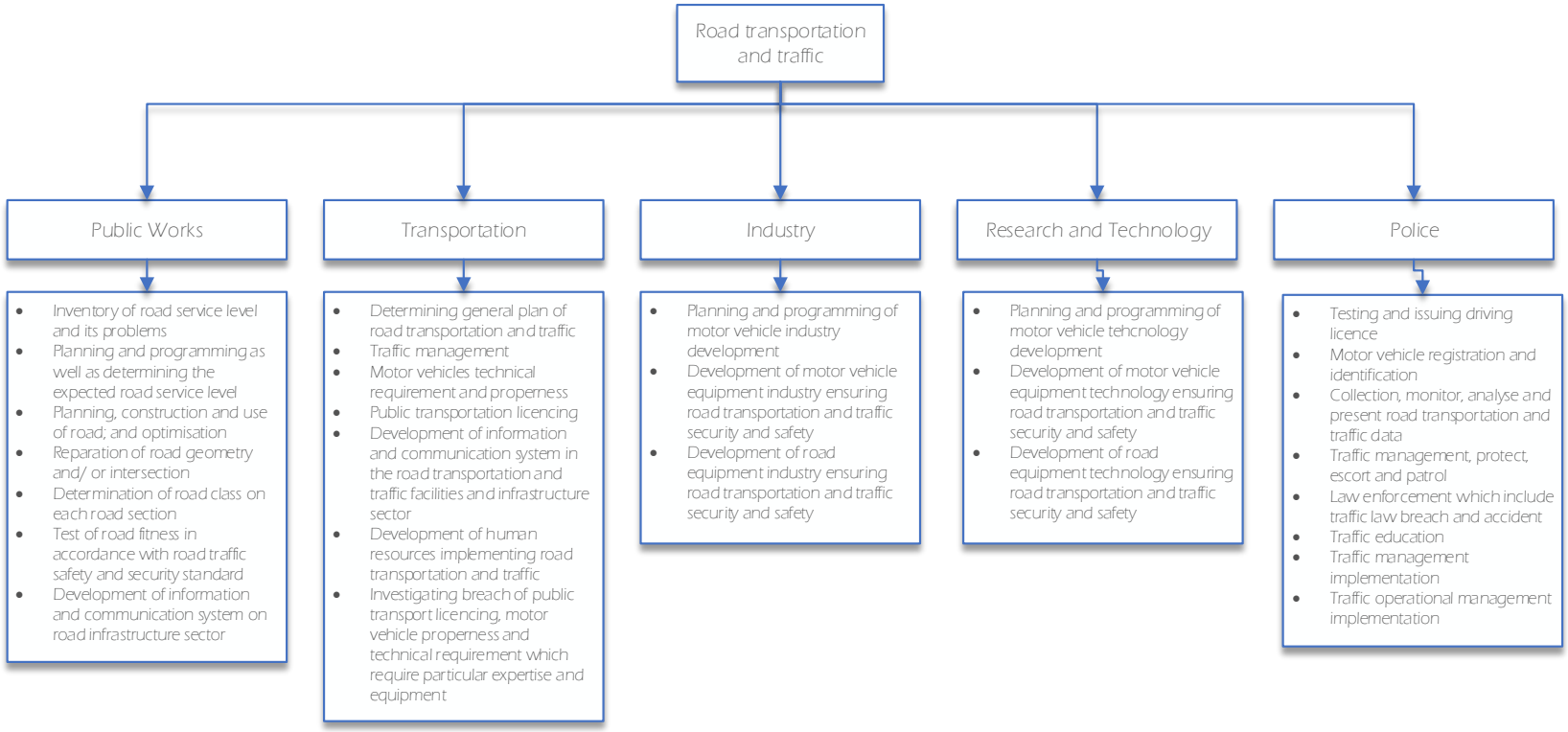


Figure 5.3 – Distribution of authorities and responsibilities on road transportation and traffic management

Source: Law (2009a)

Since these different organisations work on the same road network levels, the horizontal distribution of authorities apparently results in having conflicting and contradictory roles between them.

One of the examples is with regards to the problem caused by the overloading vehicles. As stipulated in Law no 22/2009 article 8, the public works is responsible, among others, for the planning, development and repair/ maintenance of the road infrastructure. On the other hand, article 9 of the same law stipulated that the transportation agency is responsible, among others, for investigating the breach in public transport licence, motor vehicle technical requirement, fitness and properness. Additionally, in controlling the vehicle axle load capacity, the transportation agency collaborates with the police force since the police force (article 12) is responsible, among others, for enforcing the law which includes breach of the traffic regulations.

However, the transportation agency frequently blames the public works for the rapid deterioration of the road infrastructure to be resulting from the poor construction quality they provided. The directorate general of road transportation even explicitly stated in one of the decrees no SK.81/AJ.108/DRJD/2004 (Dirjenhubdat, 2004), article 5.1, that "the (rapid road deterioration) problems are not rooted in the failure of the operator to enforce the limit, but the existing roads are not built with adequate standard." On the other hand, public work denies the accusation by stating that it was the failure of the transportation agency in monitoring and controlling the traffic, particularly the heavy-loaded vehicles, which caused the road to deteriorate rapidly.

A particular case was experienced in the Province of Riau, Indonesia where the conflict between the two regional agencies escalated in 2013 as reported by the local media Riau Terkini (2013). The public works agency was accused to have provided a poor-quality road that the road deteriorated very rapidly. Refusing to be blamed for the damage, the public works agency resists that the transportation agency was to blame for not installing the maximum load sign of 3.5 tons on the road, and that the transportation agency had failed to control the traffic. The transportation agency denied the allegation by saying that the road sign had been installed long before the public works asked them. The transportation agency further highlighted law no

22/2009 (Law, 2009a) article 2 paragraph c, which stipulates that the minimum loading capacity of class III road, the lowest class, is set to be 8 tons which is more than twice the limit that the public works had referred to (3.5 tons) . However, the article 3 of the same law also stipulates that in certain condition, the maximum loading capacity of the class III road can be set to lower than 8 tons. Accordingly, it seemed that there had been no communication between the two agencies into what the maximum loading capacity of the particular road section had been actually set for.

Other similar cases where disputes and argumentation between the two agencies regarding damaged road have also been reported in other places such as in Surabaya (Bappeda Jatim, 2011) and Jakarta (Dewi and Maris, 2014). These examples illustrate the conflicting and contradictory roles of the various government institutions involved in the road management.

In Aceh, another case of the conflicting role was also experienced as highlighted by the PM10, regarding the installation of road signs and road marks. According to the law no 22/2009 (Law, 2009a), the public works is responsible for the construction of road infrastructure, and the transportation agency is responsible for the management of road transportation and traffic. The law also stipulates that the transportation agency is held responsible for the traffic management. However, it does not explicitly stipulate which agency is responsible for the installation of the road marks and signs. This eventually led to confusion and overlapping tasks between the two agencies. As highlighted by PM10

> *"Yes, there has been overlapping (roles) as I see it. So, recently there was a workshop in Batam, and this was questioned. Where and in what condition should Public Works do the road marks and signs, and vice versa, in what condition should the transportation agency do them? And this was still unsolved." – PM10*

PM10 further argued that the unfamiliarity of public works on road marks and road signs installation had led to public works installing poor-quality materials. He further added that,

> *"And what happened now is, the quality of the road marks and signs of the public works, compared with the department of transportation is so different. Pay attention to the road from here to the east area, have you ever seen road signs which are only yellow, with nothing in them (blank signs)? Have you seen them? The black parts (the signs) have peeled off." – PM10*

The conflicting roles of the government institutions involved in the road management have been discussed in details in the above section. Accordingly, the following section will provide an insight into the issue of vertical relationship between the government levels.

In addition to the above issues, there was also an issue with regards to the vertical relationship between the governments. In terms of road maintenance, the governments cannot intervene and provide assistance to the government level other than what is directly under it. This means that the national government, under certain conditions, can only provide maintenance assistance to the provincial government, but not to the district governments, as they will be two levels down below. Having said that, the district government can accordingly receive maintenance assistance only from the provincial government. As PM01 emphasises.

> *"If (the road maintenance needs) is handed over to the national government, it won't work. This is because the national road (authority) can only go down one level. So it can only, for example, construct the provincial road. It is still possible, it is still allowed (for the provincial roads). But there are conditions. The road must be strategic. Of course, if the road is considered strategic by the (national) Public Works, even though it is a provincial road, they will handle it." – PM01*

Whilst the above discussion was addressed to the maintenance of road infrastructure in general, it was also applied in the maintenance of the post-disaster road infrastructure reconstruction assets. In the reconstruction of road infrastructure in Aceh, there was a gap in time between project completion and transfer of assets to the relevant district government. As argued by PM03, the time gap and delays in the asset transfer have resulted in some road networks being neglected of maintenance. This is particularly due to the unclear regulation and policies on which institution is responsible for the maintenance in between the transfer process. As stipulated by PM03

> *"What is also important is that… if some roads have not been transferred from the national government to the regional governments... then it must be clear if there are budgets (for the maintenance) from the Ministry of Finance, or Ministry of Internal affairs, or Ministry of Public Works. But it can't be the Ministry of Public Works as they will not touch district roads…" – PM03*

As a result, there was time where the road maintenance was neglected due to unresolved assets ownership status and maintenance responsibility. More detailed discussion on asset transfer issue will be discussed later on in section 5.4.2.3. The asset transfer issue is only briefly presented here as an overview on the impact of the national policy to the maintenance of the post-disaster road reconstruction assets.

As the national public works cannot formally intervene and assist road projects at the district level, the intervention and assistance from the ministry of the public works to the maintenance of district roads are done in a different way. Additionally, the assistance for road infrastructure maintenance from the national government is also delivered through the provision of the specific allocation fund (DAK) for the regional governments. The DAK is provided as part of the regional annual budget.

The establishment of road transportation and traffic board

In order to improve the coordination between the different institution and to improve the involvement of the stakeholders, Law no 22/2009 article 13 stipulates that the implementation of road transportation and traffic needs to be conducted in a coordinated approach. Consequently, the law further stipulates that the coordination tasks will be designated under the authority of the road transportation and traffic board at all government levels; national, provincial and district level, which need to be established at every government level. As a follow up, a Government Regulation detailing the responsibilities, task, and authorities of the board was issued in 2011 as a Government Regulation no 37/2011 (Government Regulation, 2011). A complete list of members of the board is presented in Table 5.1.

The Government Regulation no 37/2011 regarding the road transportation and traffic board, article 11, describes that the board functions as a platform to synchronise the main tasks and functions of each institution involved in the management and implementation of road transportation and traffic. Article 21 further describes that the members of the board at the regional level include a number of government officials and community representatives, as well as the private sector working in the road sector. In Aceh, the establishment of the road transportation and traffic board was regulated by a Governor decree no 551.1/541/2011.

Table 5.1 – Member of Road Transportation and Traffic board

No	Member of forum
1	Head of governments (Governor, Bupati or Mayor)
2	Head of Police force
3	State-owned or district-owned companies working in the road transportation and traffic sector
4	Association of public transportation companies
5	Representatives from the high education institutions
6	Expert in the road transportation and traffic
7	Non-government organisations focusing on the road transportation and traffic, and
8	Road transportation and traffic Watchdogs at the district level

Source: Government Regulation (2011)

According to PM10, the establishment of the road and traffic board had resulted in improved coordination between the government institutions involved in the management, and that the implementation of road infrastructure development program had been showing a positive progress. Specifically addressed at the coordination between the public works and the transportation agency, PM10 stipulates that there has been an improved coordination between the two agencies. As he said

> *"There were overlaps. That is why (now) we always clarify… Public works will submit (their list of projects), we will check… so there will be no overlaps. In the last two years we did this… not previously." – PM10*

As the interview was conducted in 2013, PM10's comment also shows that the issuance of Government regulation no 37/2011, followed by Governor Decree no 551.1/541/2011, appeared to be immediately in effect after their issuances.

The above sections have provided in-depth discussion on the impacts of external factors to the road maintenance capacity of the Local Governments. The various external factors affecting Local Governments' capacity in the maintenance of road infrastructure have been discussed,

ranging from the legal and regulatory, political, socioeconomic, as well as the inter-organisational relationship aspects. The cognitive map of the external factors affecting the road maintenance capacity is presented in Figure 5.4 .

Accordingly, the following sections will present factors affecting the road maintenance capacity from the internal side. The internal factors are divided into two categories, the institutional and technical; each of which will be discussed in a dedicated section.

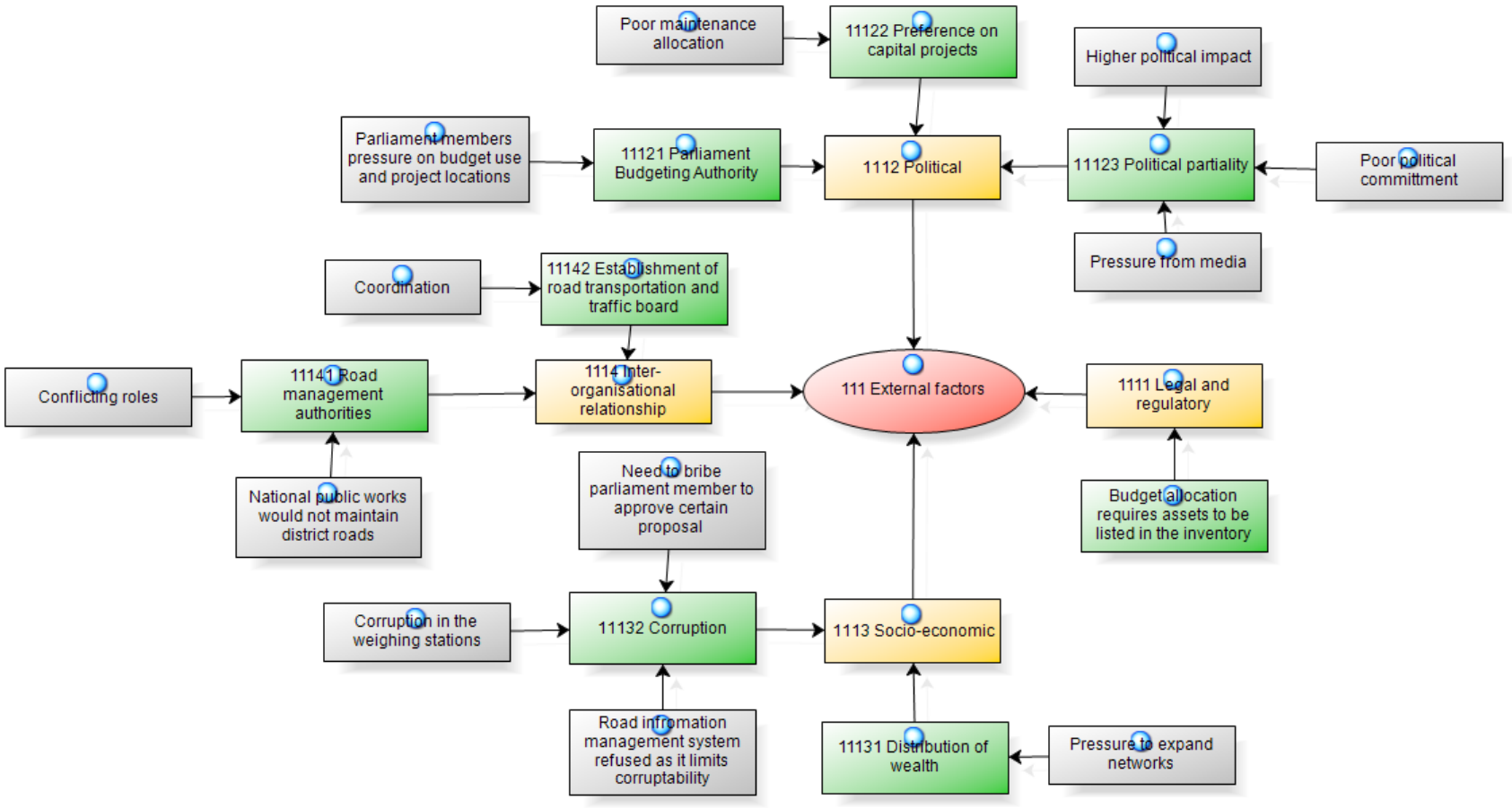


Figure 5.4 – The cognitive map of the external factors

5.4.1.1.2 Institutional factors

The internal factors of road maintenance are those within the direct control of the road authorities. The discussion of the internal factors of road maintenance capacity will be divided into two categories, the institutional and the technical factors. The institutional factors refer to the organisational and managerial arrangement of the road authorities and the likes, whilst the technical factors refer to the capability of the road authorities to perform the physical and engineering tasks (Robinson et al., 1998). The NVivo snapshot of the institution factor analysis is presented as Figure 5.5. Accordingly, the discussion of the internal factors in the following sections will be initiated by presenting the institutional factors regarding the financial management.

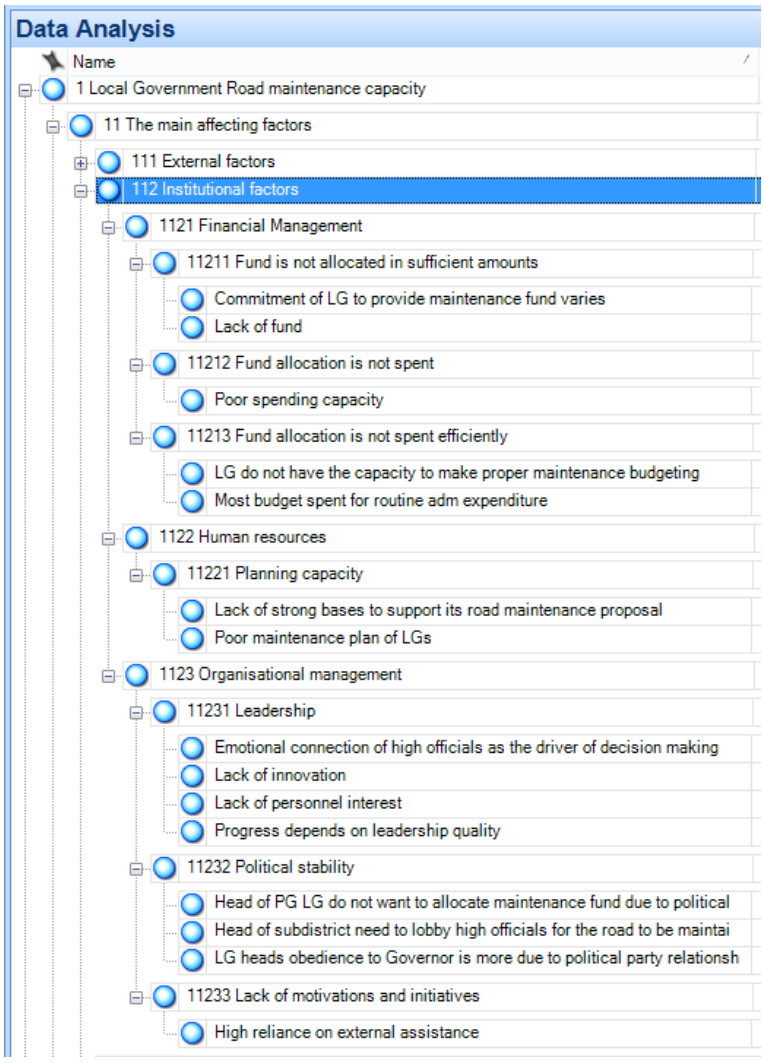


Figure 5.5 – The coding structure for the Institutional Factors in Road Maintenance Capacity

5.4.1.1.2.1 Financial Management

In this section, the capacity of the Local Governments in the road maintenance from the financial management perspective will be elaborated. The budgeting and allocation of the road maintenance needs in Indonesia follows the general budgeting and allocation procedures. Therefore, no special account or mechanism have been setup for the maintenance of road infrastructure ADB (2003) suggests that the financial problems of road maintenance can be grouped into four categories; fund is not allocated in sufficient amounts, fund allocation is not spent, fund allocation is not spent effectively, and fund allocation is not spent efficiently. As a matter of fact, the discussion of the road maintenance financial problems in the case study districts emerging from the semi-structured interviews also showed similar results. Therefore, the financial problems of road maintenance will be presented in the following section according to the four categories.

Fund is not allocated in sufficient amount

The first financial problem in the road maintenance is that the budget allocation for proper road maintenance is not sufficient. One of the main causes of the insufficient budget allocation for road maintenance was due to fund competition with other sectors and expenditure needs. With regards to competition with other sectors and other expenditure needs, PM07 doubted that the post-disaster road infrastructure reconstruction assets will be maintained by the recipient Local Governments. PM07 expressed his doubt and disappointment on the maintenance of reconstruction assets by saying that

> *"If they can maintain 50% to 60% (of the reconstruction assets), it will be very good. Putting aside the assets they received from the BRR, they can't even maintain their own assets. This is because their mind-set is that (maintenance) is not a priority." – PM07*

Furthermore, as previously described in section 5.4.1.1.1.2, the political condition greatly affects the budgeting decision. However, even though on the one hand the parliament holds the authority for budgeting, the government also have the authority to justify the proposed program and their budget expenditure plan. Unfortunately, disfavour to the road maintenance needs, the governments also give lower priority for the road maintenance needs. As a representative of the provincial government, PM05 explained

"We do (have intervention authority to the budgeting process). But in the end it depends on the budget allocation needs… the priority (for maintenance) loses to other more urgent needs." – PM05

PM05 drew an example from the education sector, where the maintenance of education facilities were also neglected regardless the current national regulation to allocate 20% of the regional budget for education. As he explained

"Currently, there is a national regulation that 20% of the budget allocation need to be allocated to the education sector... Even so, I don't think they touch the maintenance (of the education facilities)." – PM05

PM05 further explained that the local governments actually had budget allocations for the maintenance of road infrastructure. However, he was not sure if the allocation was sufficient.

"If asked whether the fund is available, the fund is available. But in regard to sufficiency, that is another issue. Regarding sufficiency, we allocate what we can." – PM05

Additionally, PM03 and PM08 highlighted that there was also an issue with regards to the commitment of Local Governments to provide maintenance allocation. As highlighted by PM03 and PM08.

"The commitment of each district varies between one district to another district, with regards to the operation and maintenance needs, particularly the maintenance needs." – PM03

PM08 further emphasised that one of the conditions to receive the foreign-funded road infrastructure projects, the benefiting local governments were required to sign a MoU, agreeing to provide budget allocation for the future maintenance needs. However, the MoU was only respected for the first year following the construction completion. For the second year, the budget allocation was not approved by the parliament. He described

"With regards to the funding (for the road maintenance needs) of the first year, I do not know how, but somehow they managed to provide it. But for the second year, the parliament immediately blocked it." – PM08

Fund allocation is not spent

In addition to the issue of insufficient maintenance allocation, there was also an issue regarding the unspent budget allocation. Concerning the financial capacity of the local governments, PM03 argued that Aceh province had been given a lot of privileges. Due to the special autonomy status, Aceh province accordingly receives a large amount of additional sums in the annual budget, called the special autonomy fund, totalling 1%-2% of the total national general allocation fund (section 2.5.6.1). However, PM03 suggested that the greater problem is rooted in the financial management capacity to spend their annual budget allocation. PM03 supported his argument by stating that

> *"A lot of privileges have been given to Aceh, but the spending quality is so poor. So it is a matter of their public finance (capacity)." – PM03*

One of the causes of the unspent budget allocation was due to the delays in the approval of the annual budget proposal. Section 2.5.5.1.3 of the literature review regarding the delays in budget approval) summarised that delays in the annual budget approval were commonly experienced in Aceh. Accordingly, the budget expending period was shortened as it would need to be expended by the 31st of December of the running year, regardless the time the budget was approved and the time the local governments were starting to use it.

Consequently, the delays in the budget approval also means that the road infrastructure project may not start according to the initial timetable and that the projects schedule frequently had to be implemented in the rainy season.

The above discussions conform to the report of the ADB about road maintenance in Asia. The ADB (2003) suggests that road agencies in Asia are typically allocated only 40% of the maintenance needs (insufficient allocation issue) and that the actual disbursements were often much less (unspent budget allocation issue). Accordingly, the following section will look at the issue of inefficient use of the budget allocation.

Fund allocation is not spent efficiently

ADB report (2003) suggests that another financial issue in the road maintenance is that the road authorities use their budget allocation inefficiently. The typical problems include large

workforce with low productivity, resulting in more funding goes to the wages than to perform the actual maintenance works; weak planning and programming, and inefficient functioning due to political interference.

The issue of inefficient use of budget allocation also emerged in the interview. As suggested by PM07, most of the budget allocation was spent on the routine expenses which mainly include the salary, official trips, and office administration. PM07 complained

> *"We also need to see it from the budgeting perspective. What percentage is used for development? In Aceh, in average 60% to 70% (of the budget) is used for routine expenses, so the remaining fund is so little." – PM07*

Similar complaint was also raised by PM09. He argued that the government should start to improve their budget efficiency, particularly by increasing personnel efficiency. He said

> *"Their general expenses are bigger than what is allocated for the development. Around 60% to 70% are used for salaries, official trips, paper, and so on. For the development is only 30%. In fact, why don't they increase personnel efficiency, right?" – PM09*

PM09 also added that improvement must be made simultaneously. Whilst on the one hand, the road maintenance problems need to be improved by establishing a proper system and building the capacity to maintain the roads, on the other hand, the local governments need to improve their expenditure efficiency. He added

> *"First, they lack of a (maintenance) system… Second, they lack of capacity, it is very limited… due to bigger allocation for general expenditure than for the development." – PM09*

5.4.1.1.2.2 Human resources

One of the most important issues in the discussion of institutional factors affecting the capacity of the local government in road maintenance is regarding the human resource. Accordingly, this section is dedicated to provide an in-depth analysis on the human-resource issue.

Lack of interest

According to PM07, the road maintenance problem is affected by the mentality and the capacity of the local government in asset management. He argued that the assets of the local governments had not been used optimally to provide income to the district and therefore, the operational and the maintenance of the assets were seen as a burden to the local budget. He argued that this was primarily due to the lack of interest and the capacity of the local government to produce creative programs and work plan. He stressed

> *"That is not a matter whether there is regulation or not. Its personnel matter. First, it's about capacity, the other is about interest." – PM07*

He further suggested

> *"There is certainly a weakness in the asset-management model of the local government. Because, the smart ones will actually see these assets as resources which have the potential to provide income." – PM07*

Planning capacity

This section focuses on the capacity of the local government in the road maintenance planning. Referring to the general development planning issues, Solihin (2009) concludes that failure in development planning can be caused by a number of reasons, they are

- Improper planning process due to lack of information, poor planning method capacity, unrealistic plan, excessive political influence which leads to ignoring the technical planning.
- Poor planning execution due to the unsynchronised process of planning and implementation, incompetent personnel, lack of community participation, which results in no support from the community.
- Inappropriate planning paradigm which leads to misled development direction.
- Planning is translated as the total control of human life, such a centrally planned system may result in development planning constraining individual initiatives, capacity building and the potential capacity of the community.

Accordingly, the analysis of the semi-structured interviews with the provincial and national stakeholders also suggested similar condition. With regards to the maintenance plan, PM01 strongly suggested that the Local Governments need to develop a reliable road management system which can be used to justify the needs to perform maintenance works, as well as the consequences of not performing the maintenance. Actually, an effort to provide the local governments with more accurate input for the road maintenance planning had been made. During the post-disaster reconstruction period, a GIS-based road information management system was developed and was offered to the local governments.

By adopting a proper road information system, PM01 added that the local governments would be able to produce a reliable justification for the road maintenance budget proposal. He said

> *"So we can propose (the maintenance needs) to the parliament, not based on a made-up justification, like how it's now done by the public works. Currently, let's just ask, if (for example) the damage cost is Rp 100 million, let's ask for Rp 200 million. What will be approved is Rp 2 million. Not Rp 200 million, not Rp 100 million. Because they do not have data to support it." – PM01*

He further added that the system would also able to provide the parliament with informed consent options regarding the consequences of selecting one of the maintenance plan over the other. As described by PM01

> *"If we have such a system, if the parliament chooses (one of the proposed maintenance plans)... The consequences of their decision can be modelled." – PM01*

As the human resources issues have been presented, the next section will progress to the issue of organisational management.

5.4.1.1.2.3 Organisational management

The organisational management refers to the performance of the local government or the road authorities in performing the day-to-day operation of their internal organisation. Also included in this category is the decision making process of the local governments.

Leadership

The first issue emerging from the interviews regarding the organisational management was that there was a conflict of interest in determining the development of road maintenance program. Addressing the issue of how the provincial government disproportionately allocates the budget allocation for the maintenance of the national road, PM10 highlighted

> *"In Aceh, those who have lived here long enough must know. Particularly for the public works projects. The Banda Aceh to Aceh Besar roads, in one year it can be upgraded several times. Whilst the road in Aceh Timur has never been touched, it was only in 2012 that it was touched. The national roads there have had potholes, but not touched." – PM10*

The reason of such imbalanced road maintenance work plan was further suggested by PM10 as a consequence of poor leadership and the resulting conflict of interest.

> *"I did an interview with public personnel, (they say) it depends on the leader. Where he is from. It cannot be detached… If that's the case for the national road, let alone the district roads." – PM10*

Political stability

Another factor emerging from the interview regarding the organisational management is that the officials in the local governments were often affected by the political pressure that may be imposed onto them.

For instance, PM02 described that the provision of road maintenance allocation for the road sections which transfer process have not been completed (refer to section 5.4.1.1.1.2) was actually possible if the head of the regional governments issued a discretion on the needs. However, he understood that the resulting political pressure hindered such action. PM02 said

> *"Actually, governor or mayor discretion is enough, if they are brave enough (to argue with the parliament). But in politics it's not done that way. Similarly, if I am given a house, how can I let the roof leaks because I have not been given the certificate. It can't be that way." – PM02*

In the decentralised system in Indonesia, the heads of Local Governments are elected by the public in an election system. Additionally, as stipulated in the Law (Law, 2004a), the autonomy

status in Indonesia is placed at the district level, reducing the power of the governor as the head at the provincial level to intervene the programs at the district level. This is mainly because the local governments hold the authority and responsibility to manage their own districts and accordingly make their own development program.

However, this condition may be different if the Bupati are from the same party as the governor. As suggested by PM06, if the head of the local governments was from the same political party with the governor, the 'Bupati' (regent) would be more compliant with governor instructions. Accordingly, such a compliance from the local governments were mainly due to the political relationship between them, rather than the hierarchical structure. Regarding this issue, PM06 said

> *"They (Local Governments' head and Governor) are now more associated because they are from the same political party. They have their own ethics. They have their own policy. So the chemistry between the governor and the Local Governments' head is more because of that." – PM06*

Consequently, PM10 explained that in order to obtain the financial assistance or road maintenance project in their area, the head of local government or sub-district would often need to lobby the higher level government. PM10 said

> *"The attention (to district roads maintenance) is poor. And they need to lobby. The head of sub-district or head of Local Governments need to use all their strength to lobby in order to get them (road projects)." – PM10*

The institutional factors affecting the performance and the capacity of the local government in road maintenance from the stakeholders at the provincial and national level have been discussed in detail in the above sections. The cognitive map of the institutional factors on the road maintenance is presented in

Accordingly, the following section will present the technical aspects of the road maintenance issue.

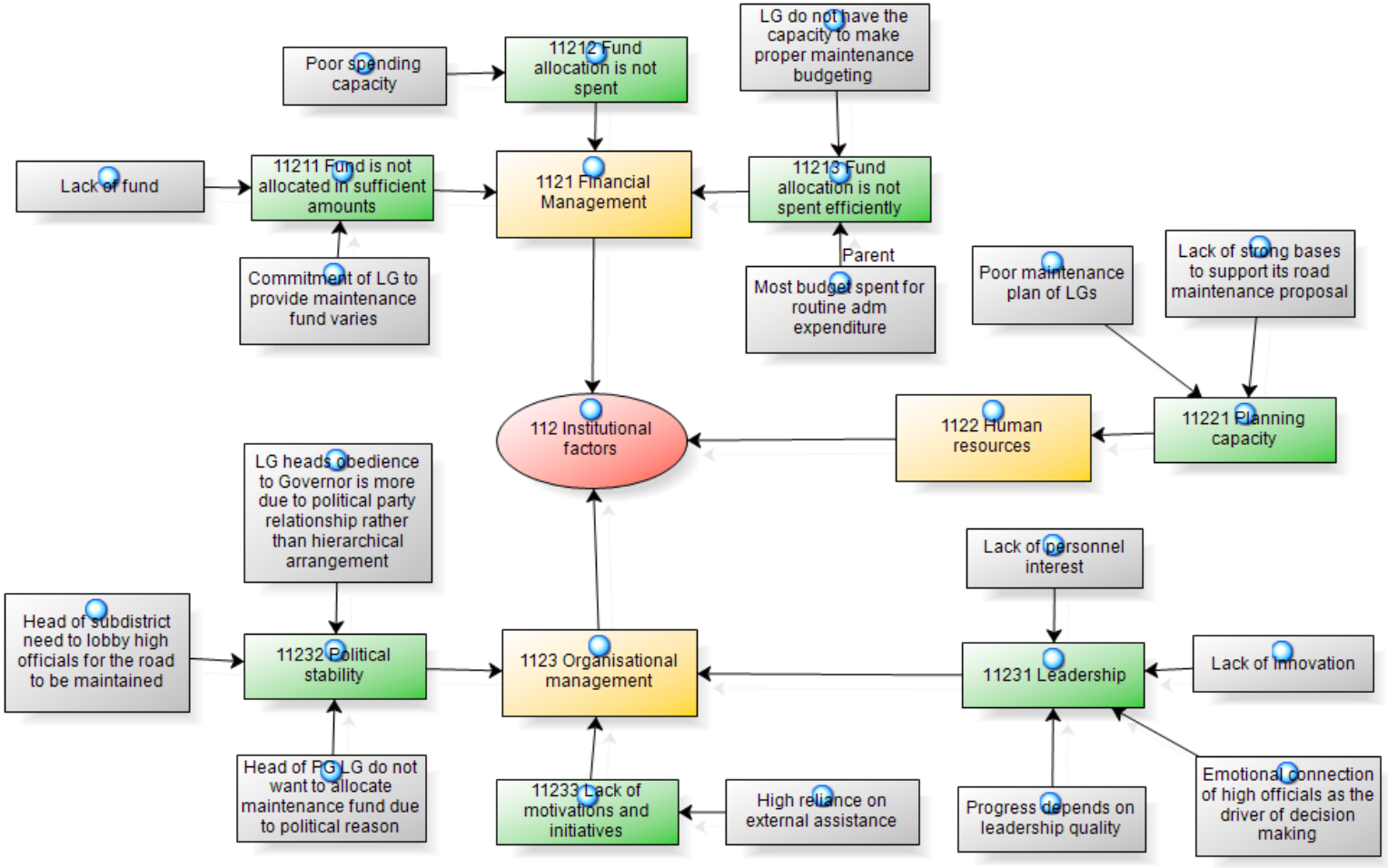


Figure 5.6 – Cognitive map of the institutional factors

5.4.1.1.3 Technical factors

The technical factors of the road maintenance capacity refer to the capability of the road authorities to perform the physical and engineering tasks (Robinson et al., 1998). Accordingly, this section will therefore discuss and present issues emerging from the interviews with the representatives from the national and provincial level. Two main categories of issues were indicated, those related to the road design and those related to the traffic overloading control. The NVivo coding of the technical factors is presented in Figure 5.7.

. Each of these categories will be presented in the following section.

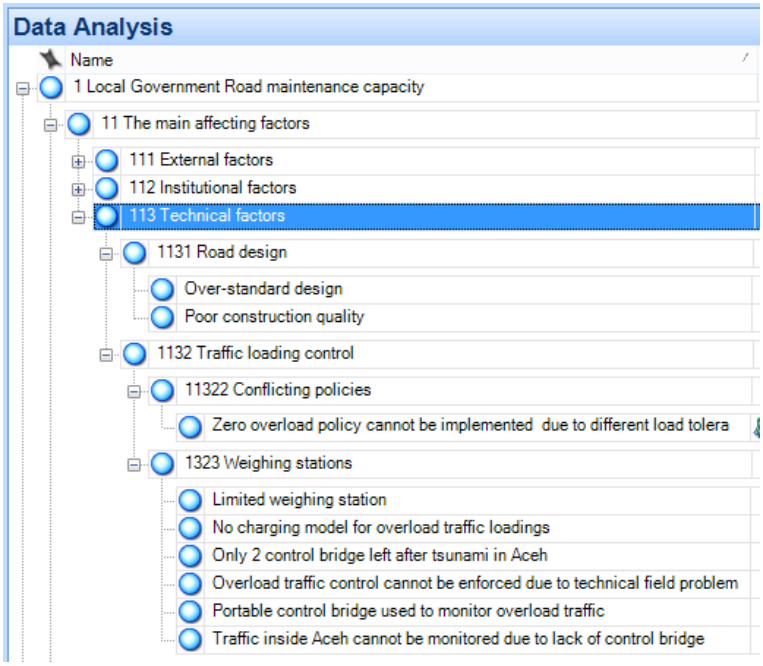


Figure 5.7 – The coding structure for the Technical Factors in Road Maintenance Capacity

5.4.1.1.3.1 Road design

Over standard design

From the technical perspective, the local governments' maintenance capacity appeared to be affected by the over-standard design of the road infrastructure provided in the post-disaster reconstruction period. The over-standard design generally refers to the new type of road construction relative to the local governments' general experience as well as to the higher road structural quality standard. Such a design was considered as an over-standard design as it raised

some discussion points in the reconstruction and the maintenance of the road infrastructure in Aceh.

The concerns emerging from implementing the over-standard road design was briefly summarised by PM08. He described that the construction of the district road in Aceh was designed to have a standard indifference to the national road networks. The use of a higher quality design was also meant to compensate the poor maintenance capacity of the local governments. It was expected that the reconstructed assets would be therefore functional for a longer period and also a slower deterioration rate.

On the contrary, some districts which were not familiar with the new type of road construction experienced technical and financial difficulties. Additionally, PM08 argued that the gaps in the technical knowledge could be overcome by providing a capacity building program to the local governments

> *"For the district road in Aceh, in particular, we made the pavement (specification) standard not far from the national roads… Some districts we observed did not have the maintenance capacity… and therefore we need to improve their technical capacity for road maintenance." – PM08*

He further added

> *"If their technical capacity is insufficient, the structure of the road requiring maintenance may need to be adjusted to their capacity… For example, if they are used to work with macadam roads, and now we paved it with Hotmix design, the (required) capacity will be different." – PM08*

PM08 explanation above illustrated the challenges that the local governments were facing in Aceh. In the reconstruction of the road infrastructure in Aceh, the standard design widely used for the road infrastructure was the Hotmix design, internationally known as the HMA. This type of structure was relatively new to the local governments in Aceh and the public works at the district level. Prior to the tsunami, the local governments commonly used macadam design for the district roads.

One of the consequences of the introduction of the standard design was that the construction and the maintenance cost were accordingly higher. This concern was expressed by PM03

regarding the objections and complains from the local governments with regards to having to perform the maintenance of the over-standard design infrastructure.

> *"Regarding Local Governments poor maintenance capacity, it will create problems when they are asked to manage or maintain assets… which are over-standard… Problems will occur if the over-standard assets have to be managed or maintained… They will object." – PM03*

Poor construction quality

The capacity of the local government in road maintenance is also affected by the construction quality. The road construction quality determines the road axle loading capacity and the deterioration rate. Accordingly, it may also determine the types and the interval between maintenance interventions. With regards to the quality of the district road infrastructure in Aceh, PM10 raised his concern that one of the main factors of the rapid road deterioration was due to the poor construction, which he accused to not have been built according to the specification. He said

> *"The construction may not be according to the specification." – PM10*

Additionally, road surface roughness is widely used as one of the indicators to determine the level of road deterioration. For instance, the international roughness index (IRI) is used to measure road surface degradation and accordingly determine the required intervention. However, road deterioration does not immediately occur in the early years of completion. Within the grace period, typically the initial four to five years of road construction, road may not show any deterioration at all. Furthermore, with regards to the construction quality, most road infrastructures start to show deterioration long after the project completion, and commonly even after it passes the defect liability period, a period where contractors are held responsible for the maintenance of the road they built.

Accordingly, in Aceh, by the time the roads were starting to show obvious deterioration, the contractors were no longer responsible for the maintenance. The contractors could no longer be held responsible for the damages, particularly on the basis that the road construction was accused to have a poor quality. The issue of holding contractors' liability gets more complicated since the poor quality issue is also then mixed with the issue of traffic loading control.

5.4.1.1.3.2 Traffic overloading control

The road maintenance problems of the district road in Aceh were commonly linked back to the issue of poor road quality and the overloading traffic. The conflict between the agency responsible for ensuring the road quality (the public works) and the agency responsible for the monitoring of the passing traffic (the transportation agency) has been discussed in section 5.4.1.1.1.4. Accordingly, this section will discuss the traffic overloading control issue from the technical perspective, i.e. the capacity to perform the traffic overloading control tasks.

The challenges and problems surrounding the traffic loading control issue in Aceh were described in detail by PM10. He explained that in the implementation of traffic overloading control, the transportation agency was facing a number of challenges. These challenges will be discussed in the following section

Conflicting policies

The first traffic loading control issue was regarding the enforcement of traffic loading capacity regulation. Particularly aimed at controlling the overloading traffic in Aceh Province, the ministry of transportation issued an instruction to enforce the zero overload from January 2009 (MoT, 2008). The policy was later supported by the directorate general of land transportation of the ministry of transportation by issuing an instruction to enforce the zero overload tolerance limit to the passing traffic (Dirjenhubdat, 2012)

The regulation was issued as a follow-up action for the implementation and enforcement of Law no 22/2009. The regulation reemphasises the point stipulated in the law no 22/2009, article 307, that no administrative penalty in the form of charges can be enforced in regard to overloading capacity. Instead the overloading vehicle must be prosecuted with a penalty of imprisonment for a maximum period of 2 months or Rp 500,000 (£25) in fine. The regulation also stressed that all previous regulations and instructions which were conflicting with the law no 22/2009 were accordingly obsolete.

However, even though the instruction practically only reemphasising the national Law, which should therefore actually be implemented nationally, it was not respected in Aceh. As

highlighted by PM10, the zero overload policy could not be implemented at the regional level as the regions made their own policies and set their own tolerance limit. He described

> *"The instruction could not be implemented nationwide all over Indonesia… because the reality is that each region allows a tolerance limit. A certain percent (of overloading capacity) will be tolerated. Each region has their own policies." – PM10*

The refusal of the head of the transportation agency of the Aceh province was also reported in the local newspaper (Waspada, 2009). It was reported that the Head of the transportation agency allowed a tolerance limit of up to 25% of the vehicle maximum loading capacity, which created a confusion to the weighing station operators.

In addition to regional governments enforcing different regulations in their regions, PM10 also raised an issue regarding the technical challenges that the weighing stations were facing on site. More discussion will be presented in the next section.

Weighing stations

The above section has provided a discussion on the traffic overloading control from the enforcement perspective. Accordingly, this section provides a discussion on the technical aspect of the traffic overloading control. As suggested by PM10, the overloading vehicles would actually need to remove the excess weight before they could continue their journey. However, PM10 explained that the weighing station operator experienced difficulties in removing or unloading the loose materials. He said

> *"We at the provincial level tried to enforce the zero overload policy. But it was hard. First, for instance, the big trucks come from Medan carrying the basic needs materials. It's not a problem if they are in unit (sacks), but if they are loose (pack), what can we do." – PM10*

He further explained that the weighing stations lack the personnel to unload materials from the prosecuted vehicles, and also lacked the facilities to store them. PM10 describes the situation as confusing

> *"If they need to be unloaded, who would do it? If they are removed, who would dispose it? They (truck personnel) won't unload it, if you want it, you do it (they would say)." – PM10*

Additionally, after the tsunami, there were only two weighing stations remain functional in Aceh. The first one was in Semadam, near the border with the North Sumatra province. The second one was in Jontor, in the west coast area of Aceh (Dirjenhubdat, 2014). The remaining stations were destroyed by the earthquake and the tsunami. Since there were only two weighing stations operating, and both were located near the border of the North Sumatra province, the transportation agency practically could only control the interprovincial traffic which passed the route where the weighing stations were located. Accordingly, the overloading traffic moving within the province of Aceh was virtually untouched. As explained by PM10

> *"So indeed (the control) is weak. If there are only those two, the control is weak. If for instance a ship hauls in Tapaktuan, it does not go through Singkil (Jontor). It may be travelling to Calang (Aceh Jaya) or Takengon (mid Aceh), which can't be monitored." – PM10*

To cope with the lack of overloading vehicle controlling facilities, the transportation agency was provided with portable weighing stations. However, most of the equipment was no longer working. This was suggested by PM10

> *"We used to have several portable loading control equipment." – PM10*

As the equipment to control the overloading traffic is limited, the overloading vehicles remain as one of the significant factors affecting the rapid deterioration rate of the road infrastructure in Aceh.

This section has provided discussions on the main factors affecting the performance of the local governments in road maintenance. The external factors, covering the legal, political, socioeconomic, and the inter-organisational relationship between government and private institutions have been elaborated in section 5.4.1.1.1. The institutional factors which include the financial management, human resource and organisational management have also been discussed in detail in section 5.4.1.1.2. Finally, the issues surrounding the technical factors related to the road design and traffic overloading control have been presented in section 5.4.1.1.3. The cognitive maps of the main affecting factors on the local governments' road maintenance capacity is presented in Figure 5.8. Having presented the factors affecting the

capacity of the local government in road maintenance, the following sections elaborate the issue of road maintenance capacity building in the post-disaster reconstruction.

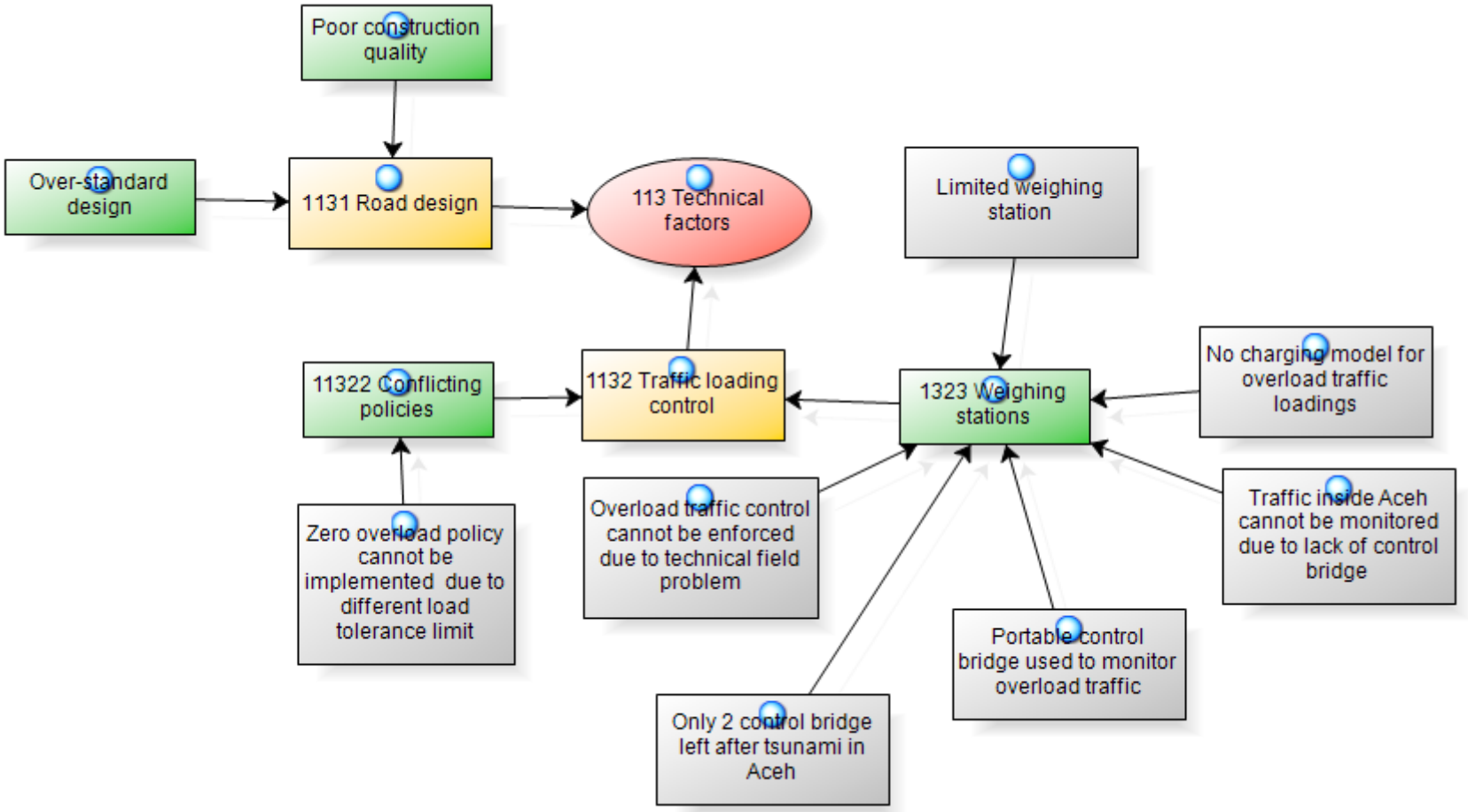


Figure 5.8 – The cognitive maps of the technical factors

5.4.1.2 Road maintenance capacity building in post-disaster reconstruction

The previous sections have provided an insight into how the external and the internal factors affected the capacity of the local governments in the maintenance of road infrastructure from the perspective of the high-level officials and policy makers. The focus of the study is the capacity of the local governments in the maintenance of the road infrastructure assets after the post-disaster reconstruction activity in Aceh. Accordingly, following the previous discussion, this section is dedicated to provide an analysis on the issue of capacity building activities in the road maintenance within the context of post-disaster reconstruction. The discussion will be initiated by presenting the capacity building approaches as it emerged in the interviews, followed by the challenges faced in the implementation of the capacity building programs in post-disaster reconstruction.

5.4.1.2.1 Capacity building approaches

One of the main concerns of the post-disaster reconstruction in Aceh highlighted in this study is that the reconstruction resulted in a great number of assets to the local governments, who are held responsible for the operation and maintenance. Accordingly, in the case where local governments' capacity has been renowned to be low, decision need to be made with regards to the scale and approach of the post-disaster reconstruction activity, particularly if there was a threat that the investment made in the reconstruction could diminish in a short period. Accordingly, it was argued that capacity building program is an important component of post-disaster reconstruction.

From the discussion with the interviewees, it emerged that the capacity building program in the post-disaster road reconstruction should be targeted at the main stakeholders of the road maintenance, particularly the local governments and the local consultants. Ultimately, such effort was expected to improve the attitude and the mind-set of the road maintenance stakeholders which would eventually stimulate the change.

In this section, the various approaches and methods of implementing the capacity building programs related to the road maintenance, as construed by the interviewees will be discussed. The coding structure for the capacity building approaches is presented in Figure 5.9.

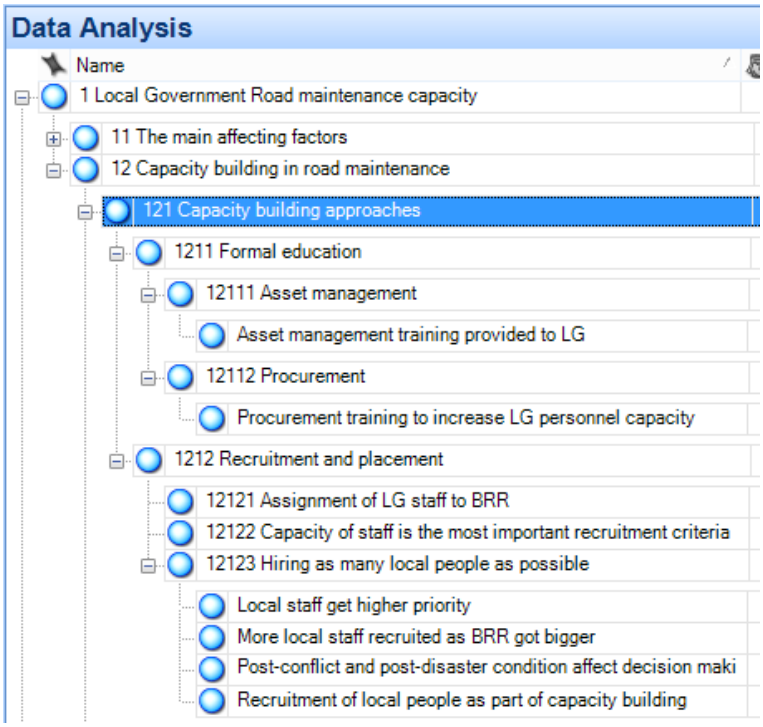


Figure 5.9- Coding Structure for the capacity building approach

5.4.1.2.1.1 Formal education

The first capacity building approach took place in the form of formal education sessions such as the provision of trainings, seminars, workshop and skills certification.

In the post-disaster reconstruction period, various seminars and trainings were provided to different target groups. Some of the trainings which were relevant to the road maintenance capacity includes procurement, asset management and road construction trainings. The procurement capacity of the local government personnel was one of the main concerns during the post-disaster reconstruction. By improving the procurement capacity, it was expected that it would eventually lead to improved financial accountability and accordingly improve the local governments' budget expenditure capacity.

As added by PM04, the provision of the procurement training for the local government personnel was part of the commitment to improve the local governments' personnel capacity

"What we frequently did was (training) for procurement of goods and services. Project management training… because our commitment was to build the capacity of our colleague from the Local Governments." – PM04

Additionally, asset management trainings were also provided to the local governments' personnel. PM02 described that during the disaster reconstruction period, the local governments were also given trainings to use the SIMDA software, a software for the regional asset information management system. By implementing and applying the software, it was expected that the local governments would be able to better prepare the maintenance work plan. PM02 explained

"SIMDA. Information system for asset management. It is actually a capacity building (program), in short, to make a balance sheet, to know for example the cycle of maintenance, and so on." – PM02

Not only were trainings provided about the pre-construction skills, trainings were also provided to the local government personnel regarding the quality control and the quality assurance of the road construction.

5.4.1.2.1.2 Recruitment and placement

In addition to the formal educational sessions provided to the local governments' personnel in forms of trainings and workshops as mentioned above, the capacity building efforts to the Local Governments also occurred in the form of recruitment and placement of Local Government personnel in the BRR. As described by PM04, the involvement of the local personnel in the BRR was aimed at both improving the capacity of the local governments and building the sense of the ownership to the reconstruction assets by involving the locals in the reconstruction process. This was described by PM04

"Two things expected. First, the capacity building of our Acehnese friend. Second, let's rebuild Aceh together. Those are the point. I was warned… to recruit local people. Otherwise, they would not feel involved in the reconstruction of Aceh." – PM04

Another justification of recruiting the local governments' personnel, as suggested by PM09, was that after the tsunami many of the local governments' personnel were practically inactive

as a consequence of the devastated physical and organisational structure of the government. PM09 said

> *"We used their (Local Governments) personnel because they were also idle… so we used their personnel." – PM09*

From the human resource management point of view, PM04 suggested that since the reconstruction, which was led by the BRR could not rely entirely on the local human resources, BRR had to accordingly recruit personnel from outside of Aceh. However, to ensure that the capacity building process could take place along the reconstruction activity, PM04 emphasised that the local personnel dominated the composition of personnel. He explained

> *"The composition was 60-40, it was even 70-30. 70% were Acehnese, and the 30% was from outside. It started with around 55-45… as the organisation got bigger, more positions were filled with the Acehnese." – PM04*

Additionally, PM04 suggested that the involvement of local personnel did not only take place in the form of distributing the personnel composition between local and non-local personnel, but was also in the form of giving higher priority to the local people in the recruitment process. PM04 explained

> *"If, for example, there are four candidates, two from Aceh and two from outside of Aceh, if the marks (qualification) almost equal… I will choose the Acehnese. If the outsiders have slightly higher marks… I will choose the Acehnese. Only when it's far (higher), I will choose outsiders. Because certain qualifications are not available in Aceh, that's the only reason." – PM04*

However, he further highlighted that regardless the effort to give the local people a higher priority in the recruitment process, the capacity of the personnel remained the most important factor. He said

> *"The first consideration would be the capacity. The capacity of each of the personnel, whether they were appropriate or not. Or, the skill was required there or not… we may choose someone else, which could be Acehnese or not." – PM04*

In addition to building capacity of the local people as part of the post-disaster reconstruction, the peace agreement MoU also particularly stated the requirement to involve the ex- GAM in

the reconstruction process. When asked if there was political pressure in the recruitment of ex-GAM personnel in the BRR, PM04 said

> *"The intervention would be minimised… it had to be considered why recruit a certain person… It was not just to let loose (uncontrolled). Otherwise, there would be many people coming in but not knowing what to do with them." – PM04*

However, PM04 admitted that such condition was a consequence and part of the post-conflict reconstruction. As he said

> *"One, the damage was due the tsunami. Second, the post-conflict condition need to be considered." – PM04*

The above statement concludes the various capacity building approaches adopted in the post-disaster road reconstruction activity. The following section will therefore provide a discussion on the challenges experienced in the capacity building efforts.

5.4.1.2.2 Capacity building challenges

The efforts of capacity building of the local governments, particularly in the road maintenance, appeared to have experienced a number of challenges. These challenges, will be described in the following section.

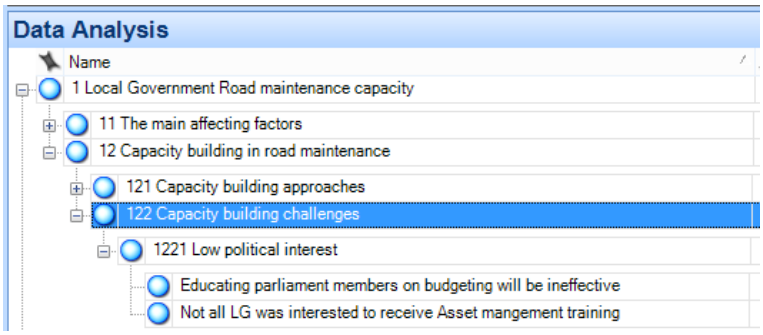


Figure 5.10 - The coding structure for the capacity building challenge

The main challenge of the capacity building program emerging from the interviews was the lack of political interest in the capacity building programs. The poor political interest in the capacity building programs was also excused as an impact of the political condition is Aceh. After the

tsunami, which was followed by the signature of the peace agreement between the Indonesian Government and the Aceh Free Movement (GAM), most of the district governments and parliaments were dominated by ex-GAM personnel.

Whilst on the one hand the capacity building program for the Local Government personnel is considered to be limited, on the other hand, an effort to improve the planning system, had been refused by the Local Governments due to the low interest on the system. This was particularly experienced in the asset management capacity building program. As explained by PM02

> *"The SIMDA (asset management software) system… honestly not everyone (Local Governments) wanted to accept it. The early adopter was the mayor of Banda Aceh. He was the early adopter of SIMDA. The remaining (districts), it was after we (BRR) were dismissed that some districts asked please also make one for us." – PM02*

Additionally, one of the most influencing factors to ensuring that road infrastructure is maintained is the sufficiency of budget allocation for the maintenance needs. Thus, the quality of the budget expenditure plan is very important, and is accordingly argued to be the essential skills. However, there appeared to be lack of capacity building program aimed at improving the budgeting skill.

As discussed previously in section 5.4.1.1.1.2, the budgeting process was highly influenced by the parliaments. Accordingly, it was suggested that there was a considerable need to provide the parliament members with the budgeting skill trainings. However, one interviewee saw that the results of such effort would be dubious as the parliament members are practically replaced every five years. As PM08 stated

> *"It is difficult. Because they are replaced every five years." – PM08*

In addition to the aforementioned problems, another challenge in the capacity building of local governments' personnel, particularly with regards to the road maintenance capacity was due to the high pressure on accelerating and speeding up the recovery process. As a consequence, the reconstruction was more focused on the reconstruction of the physical infrastructure and

that the capacity building programs specifically aimed at improving the road maintenance capacity appeared to be lacking.

5.4.1.2.3 Summary

The issues in the capacity building, covering the capacity building objectives, approaches and challenges have been elaborated profoundly in this section. Additionally, the cognitive map presenting all of the capacity building issues emerging from the data analysis is illustrated in Figure 5.11. Since the research focuses on the capacity of the local government in the maintenance of the post-disaster road reconstruction assets, there is a need to link the current local governments' road maintenance practices with the post-disaster reconstruction activity and elaborated in more detail.

Accordingly, the following section will provide an in-depth discussion on the links to the post-disaster reconstruction. The section will cover the issue of stakeholders' involvement, consideration of maintenance, the asset transfer process, and will be concluded by the discussion of the post-disaster road reconstruction success indicators. As the issues surrounding the local governments' capacity in the maintenance of road infrastructure are closely related to the post-disaster reconstruction activity, some of the concerns have been mentioned in the previous sections. However, these concerns will be reemphasised to provide a thorough understanding of the link between road maintenance capacity and the post-disaster road reconstruction process.

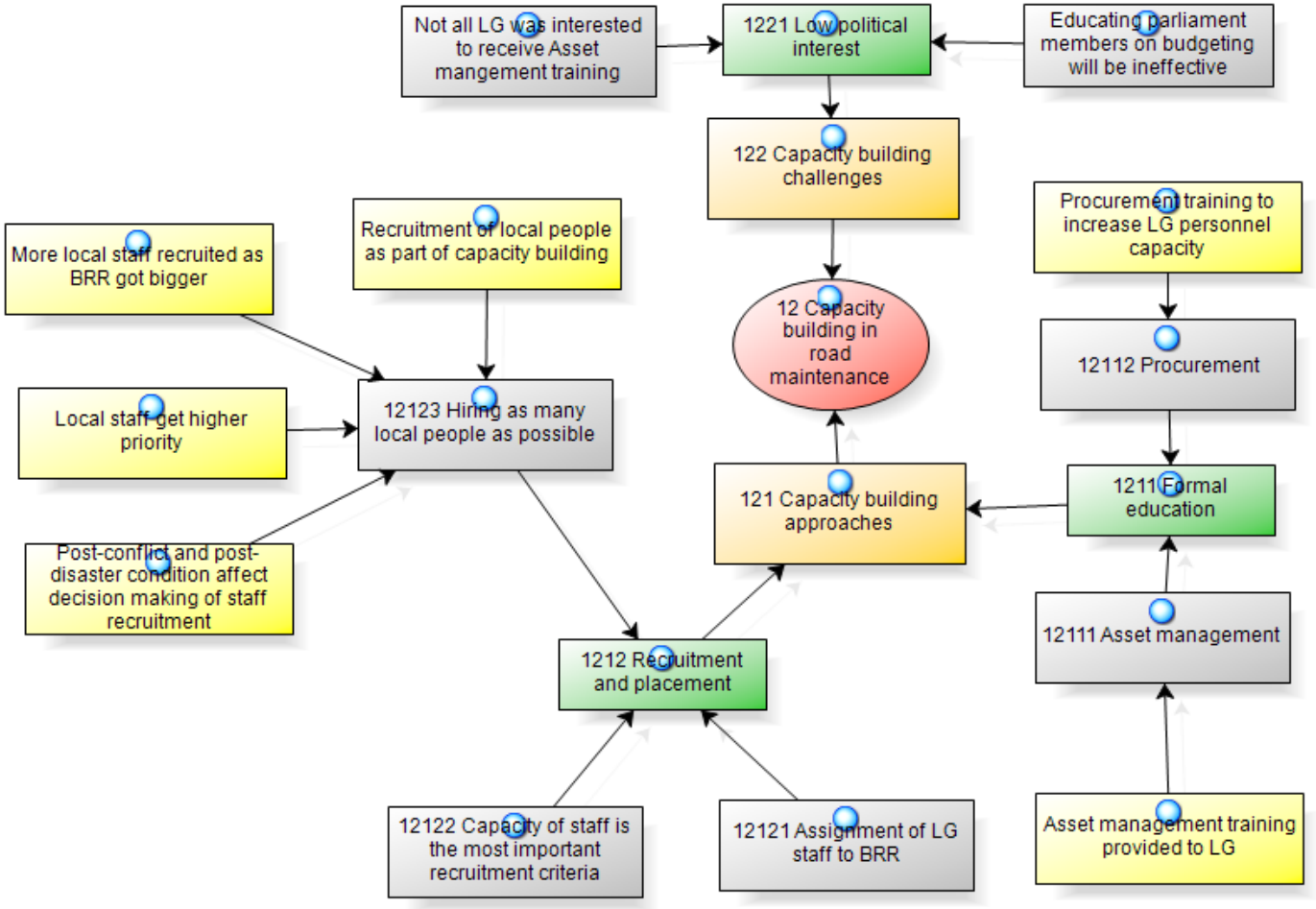


Figure 5.11 – Cognitive map of the capacity building in road maintenance

5.4.2 Links to post-disaster reconstruction

This section is focused on discussing the links between the post-disaster reconstruction and the capacity of the local governments in the maintenance of road infrastructure. Accordingly, this section will discuss the issue of local governments' involvement, consideration of maintenance needs, the asset transfer process, and the success indicators of the road infrastructure reconstruction.

5.4.2.1 Local governments involvement

From the interviews, it emerged that the involvement of the local governments in the post-disaster road reconstruction activities was conducted in four ways. It was suggested that the local governments were involved in the reconstruction of the road infrastructure by the means of getting inputs for the road reconstruction blue print, assignment of government officials in the BRR, distribution of tasks and coordination, and through the establishment of joint secretariats. These four methods of local governments' involvement will be elaborated in the following sections. The coding structure for the local governments' involvement in the reconstruction of the road infrastructure is presented in Figure 5.12

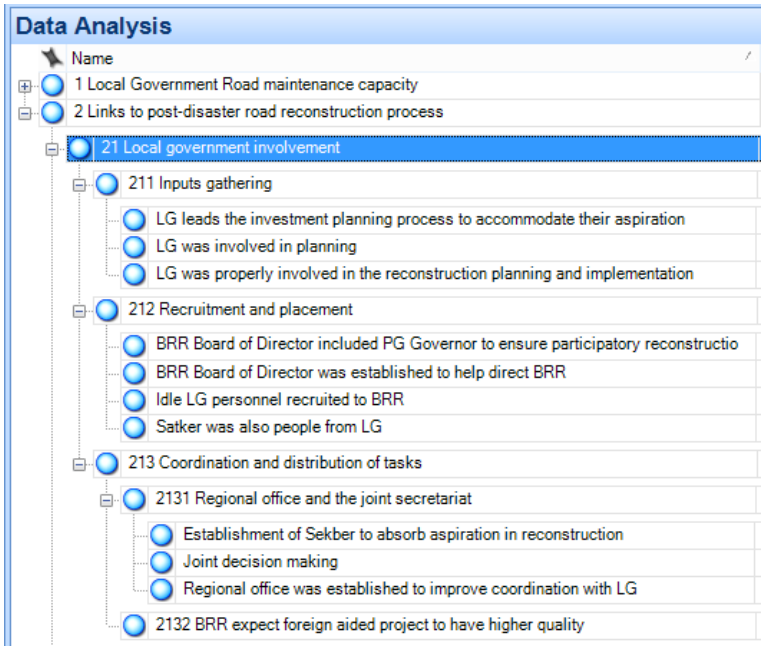


Figure 5.12 - The coding structure for the involvement of the local governments

5.4.2.1.1 Inputs gathering

The stakeholders involvement method included in this category consists of activities where the BRR and other government institutions gathered together to collect input for the reconstruction plan. The local governments were involved in the planning process even though it was constrained by the fact that they were also victims of the disaster

The challenge was described by PM09. According to him, the local governments were not primarily involved in the implementation process because they were devastated by the disaster. He said

> *"In the planning… in the programming (local governments were involved). The coordination was done during the planning and programming process. Afterwards, the implementation was done separately… They were actually not in the position that was strong enough to do the works, because they were also victims (of the disaster). They lost staff, assets, equipment, and so on. Even their documents were missing." – PM09*

Supporting the view of PM09, PM03 gave similar comment and added that the local governments were involved in the implementation process as the project monitoring body. He stated

> *"I think the involvement of the local governments in the planning, in the consultation (process) were obvious. During the implementation, the monitoring task, (local governments' role) was also obvious." – PM03*

On another occasion, PM01 explained that the BRR assisted the local governments prepare their annual investment plan. Instead of doing it for them, he highlighted that the local governments led the process and the BRR facilitated the process based on the local governments' plans. He said

> *"The (annual) investment plan was made by the LGs. If you ask how we absorbed (LGs) aspirations, it is through it. I didn't make a system where we ask them (to do things), no. I put them in the front. You (LGs) make it, I will facilitate. You plan your development, I will guide you." – PM01*

He further added that the process changed the typical top-down approach to the bottom-up approach.

"We changed the top-down (approach) to bottom-up. What is better than that? Nothing. If I ask them for the aspiration, it would still be top-down. I mean, if I want to develop an area, I ask you what you want; it would still be top-down. Here… You (the LGs) are in the front, you plan, and I will give you the tools to make it." – PM01

The next method of local governments' involvement in the reconstruction process was through the assignment of the local government personnel in the reconstruction agencies.

5.4.2.1.2 Assignment of local government personnel

Another form of local governments' involvement in the reconstruction process was the assignment or appointment of government employees to the BRR as board of directors or loaned staff. Not only did such arrangement acted as a form of capacity building, as described in section 5.4.1.2.1, it also helped merging and blending the various institutions involved in the process.

The involvement of stakeholders in the post-disaster reconstruction process through assignment took place at the various levels. At the high level, this was done by including the governor in the BRR organisation structure. As described by PM03

"In the implementation, the BRR also had what was called board of directors… The governor is there." – PM03

Additionally, at the implementation level, the reconstruction agencies recruited the local governments' personnel to be posted in various positions and levels. As described by PM09, the BRR utilised the idle personnel in the local governments to help the BRR in the reconstruction process. He further added that the reconstruction needed to involve the local personnel, as they know the area very well. He said

"The (LGs) staff that was not used, or was idle, we asked to help us." – PM09

5.4.2.1.3 Distribution of tasks and coordination

Another form of local governments' involvement in the reconstruction process was the distribution of tasks and coordination. In the reconstruction of Aceh, BRR was in charge to coordinate and lead the reconstruction process. Part of the tasks involve coordination with the regional governments, donor agencies, NGOs, as well as the private sectors with regards to the

distribution of reconstruction projects and tasks. The coordination and distribution of reconstruction tasks might occur in the form of distribution of areas (appointing certain areas to certain organisation), sectors (appointing certain development to certain organisation i.e., housing or sanitary needs), or functions (appointing certain phase of project to certain organisations, i.e. planning, construction, etc.).

Additionally, the distribution of task with the regional governments in the post-disaster reconstruction process also took place in the form of the land acquisition process. PM05 explained that in the road reconstruction process, the provincial government was responsible to acquire the land required for the project. He said

> *"The main task of the provincial government in the (road) reconstruction was to acquire land. The land acquisition was absolutely the obligation of the provincial government. Done by PG's personnel. Paid by the provincial budget." – PM05*

He further described the process as

> *"As the planning was completed, it was handed to us. Our job was to acquire land for the whole roads. If the road diverted to a route which was not its original route, we had to acquire the land." – PM05*

5.4.2.1.4 Establishment of joint secretariats

Furthermore, within the 4 year period of BRR in Aceh, the BRR experienced a number of organisational changes. The organisational changes were required to accommodate the growing needs in the reconstruction process. One of the changes include the establishment of joint secretariats and the regional offices.

PM02 describe the arrangement as

> *"With regards to public infrastructure, we had a joint-planning. It was called joint secretariats. Between LGs, normally (represented by) the planning agencies, and our (BRR) regional office." – PM02*

Additionally, the regional offices were established to improve coordination with the district governments, in order to accelerate the reconstruction process. As suggested by PM07

"The regional offices were established not other than to improve coordination with the district government, so it would be quicker." – PM07

One of the objectives of the joint secretariats was to avoid duplication of programs. As PM02 further stressed

"We ensure that there would be no project duplications… We shared tasks." – PM02

CS18 further justified that project selection and prioritisation was done and discussed in the joint secretariats and was therefore requested and approved together. He said

"The proposal was discussed in the joint secretariats. The joint secretariats consisted of the BRR and the district governments. From there, program priorities were made… That is why BRR did not want to snatch programs… they need to be discussed in the Joint secretariats." – CS18

As the various ways of local governments' involvement in the reconstruction of road infrastructure in the post-disaster reconstruction process have been discussed, the following section will cover the issue of maintenance needs consideration in the reconstruction period.

5.4.2.2 Consideration of maintenance

In the post-tsunami reconstruction in Aceh, the amount of pledge exceeded the needs to restore the affected areas to the original condition. As a result, building back better principle was adopted and was applied in the reconstruction. In the road sector, the reconstruction activities resulted in more than 3600 km of roads were reconstructed, nearly 1000km more than what were initially destroyed by the earthquake and tsunami.

One of the concerns resulting from the extensive scale of reconstruction was the sustainability of the reconstructed road assets, particularly with regards to the maintenance of the district roads by the respective local governments. Accordingly, this section is focused on analysing the maintenance needs consideration during the process of road infrastructure reconstruction. Data analysis shows varying views on the maintenance consideration issue, which will be presented in the following sections

5.4.2.2.1 Considered

With regards to the consideration of maintenance needs for the road infrastructure, some interviewees notified that the future maintenance needs was considered and included in the decision making process of the road reconstruction projects. The consideration of maintenance needs were reflected and justified in two ways, as presented in the following sections.

One way of ensuring that the road infrastructure is maintained by the local governments took place in the form of setting up an MoU between the BRR and the respective local governments. In the MoU, local government expressed their willingness and acceptance to maintain the roads that will be built by the BRR for them. Additionally, the MoU also stipulated that the minimum annual allocation required to maintain the particular road section as much as Rp 20 million per year, with an increase of 5% for each of the following year as a consequence of asset depreciation. As explained by PM08

> *"The district roads… we expected that once the construction has been completed… all projects at the district level would be maintained, and have sufficient operational allocation… To anticipate this, there was no other way than to require the commitment of the respective Bupati… Project in the respective district would not commence before the Bupati signed the MoU (regarding) their acceptance to maintain and provide allocation for the maintenance and operations. It is also stipulated there, the maintenance and operational allocation (requirement) for the first year. It needs to be detailed and the details must be submitted on the final handover of the projects." PM08*

However, the MoU for the maintenance needs between BRR and the respective local governments was only done for the foreign-funded projects, particularly those included in the IRFF project. No MoU was required for projects funded by the state budget.

Additionally, as previously discussed, setting up an MoU between the BRR and the local governments was only applied to the foreign-funded projects and not for the self-funded (national budget) projects. Justifying the absence of an MoU requirement for the remaining projects, PM02 suggested that the financial resources of the local governments in Aceh was seen to be sufficient to maintain the road. This was particularly because Aceh province receives an additional budget allocation from the national government as part of its Special Autonomy

status. Particularly addressed at the financial needs for the road infrastructure maintenance, PM02 stipulated

> *"They (LGs) are supposed to be able (to maintain)… the reconstruction fund was abundant. Aceh was not like this before that time… After the reconstruction, with 2% DAU (special autonomy fund), from the economic perspective, the economic condition of Aceh will not change." – PM02*

He further explained

> *"We were very worried that as we had Rp 20 trillion per year, poured in Aceh, and was pulled (stopped) in a sudden… it would collapse… But it didn't, due to the additional fund of the 2% DAU (special autonomy fund). It will sustain them (reconstruction assets)." – PM02*

The above suggestions refer to the additional budget allocation called special autonomy fund that Aceh province receives from the national government since 2008 (section 2.5.6.1). Accordingly, from the financial aspect, the local governments were expected to have the fund required for the maintenance.

Another preventive measure adopted in the post-disaster reconstruction of the road infrastructure in Aceh was to use a higher road specification as a standard design. The Hotmix (HMA) pavement type was widely used in the reconstruction of road infrastructure in Aceh, replacing the macadam type which was widely used by the local governments prior to the tsunami. By using the higher quality pavement type, it was expected that the road infrastructure would accordingly last longer, to compensate the expected poor road maintenance capacity of the local government. As explained by PM08

> *"For the district road in Aceh, in particular, we made the pavement (specification) standard not far from the national roads." – PM08*

Whilst the preventive measures adopted in the post-disaster road reconstruction have been discussed in this section, most of the road sections were in fact suffering from the road maintenance neglect. More discussion will be elaborated in the following section.

5.4.2.2.2 Not considered

Whilst the above views suggested that the road maintenance need was considered in the post-disaster road reconstruction process, it also emerged from the interviews that the road maintenance need was not well put into account in the planning and reconstruction process. This was stipulated as due to three reasons; the reconstruction was focused on the needs of the affected community, the reconstruction was focused on the reconstruction speed in order to accelerate the recovery process, and that the local governments was expected to be responsible to maintain the reconstruction assets returned back to them. Further detail of these issues will be discussed in the following sections.

The first excuse for overlooking the future road maintenance needs in the road reconstruction process was suggested by PM05 that the reconstruction process was focused on the recovery of the affected areas and accordingly focused on the local governments' needs. He argued that the development of an area should not be based on the local governments' maintenance capacity but rather on the needs. He highlighted

> *"I think, development should not be according to Local Governments' capacity. Rather, development should look at the community needs, not based on the capacity and ability of local governments to maintain (the assets) afterwards. Not like that." – PM05*

He further said

> *"The most important thing in the reconstruction is to build everything according to the community needs… After that is done, the management, sufficient or not (the maintenance capacity problems) can be overcome slowly." – PM05*

Whilst reconstruction needs were considered as the main drivers in the road reconstruction process, PM09 also argued that the pressure to speed up the recovery process was high. Accordingly, he suggested the consideration of future maintenance needs of the road infrastructure was put aside. He stated

> *"It is actually like this. Did we, when we were planning, we constructed, we thought about the other end (maintenance)? No. We actually initially did think that way. We were thinking about how to provide the infrastructure quickly. Regarding the maintenance, put aside. Because the demand was so high." – PM09*

Furthermore, another justification for not putting into account the future maintenance needs in the reconstruction of road infrastructure was expressed by the interviewees in regards to the asset ownership. Since the reconstructed road infrastructure actually belonged to the local governments, the argument was that the local governments were accordingly responsible for the maintenance of the assets.

PM09 suggested that the BRR was responsible for providing the capital projects and that the local governments as the end beneficiaries of the project were held responsible for the operational needs, which included the maintenance. PM09 stated

> *"The philosophy was that capital project was the responsibility of the BRR. But when we talk about operation, it was indeed the responsibility of the beneficiaries. Since the beginning, the setting has been like that… So we reconstructed in the proper way. Reconstructed them better. But for the maintenance, it was the local governments to bear. – PM09*

Giving an illustration to explain his argument, PM09 added

> *"Actually, from the asset law, it is their asset. We only did construction on top of it. That's it." – PM09*

The above discussions have provided an insight into the issue of maintenance needs consideration during the post-disaster road reconstruction. Furthermore, the following section will cover the issue of asset transfer process, the process of returning the road reconstruction assets to the respective local governments.

5.4.2.3 Asset transfer process and challenges

The assets reconstructed by the BRR were transferred to four types of institutions. The reconstruction assets of BRR were transferred either to the national government, provincial government, local governments, or the community, depending on the nature and the end beneficiaries of the project. With regards to the reconstruction assets at the district level, the assets would initially need to be registered as state assets and therefore managed by the Directorate General of State Asset Management. Once the assets have been registered as the state assets, they would be transferred back to the district government for the operation and maintenance. This process was explained by PM02.

However, due to the great number of assets to be transferred to the regional governments, the asset transfer process could not be completed by the end of BRR period. Accordingly, the asset transfer tasks were continued by the liquidation team, an agency specially established to transfer the reconstruction assets to the particular governments. The coding structure of the asset transfer process is presented in Figure 5.13.

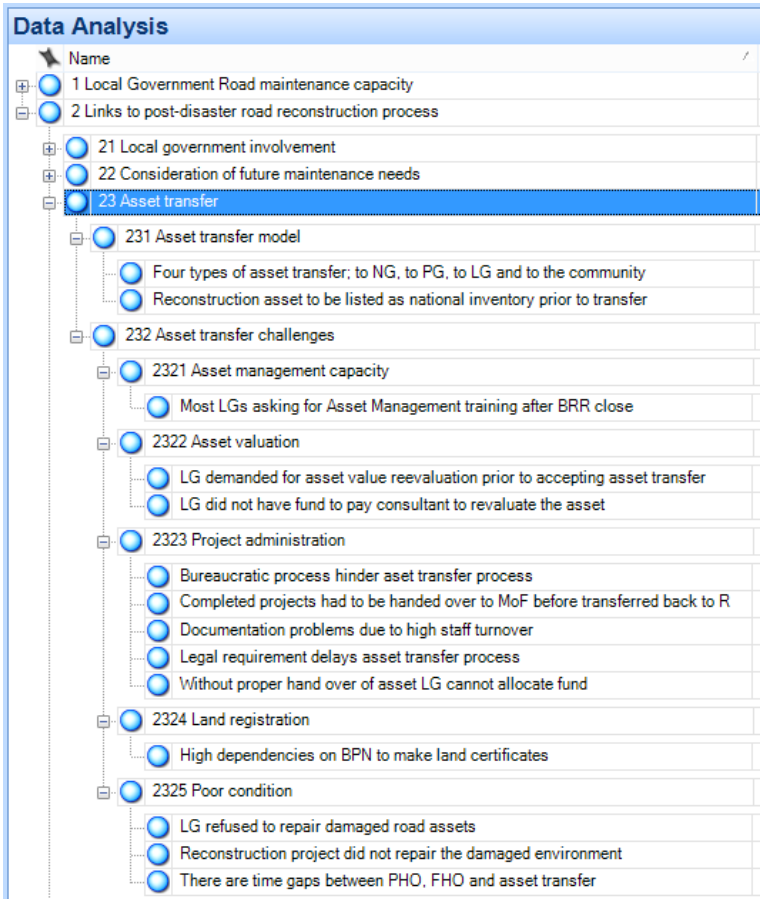


Figure 5.13 – The coding structure of the asset transfer

5.4.2.3.1 Challenges

The process of asset transfer experienced a number of challenges. These challenges frequently resulted in delays in the asset registration process and therefore the absence of budget allocation for the operation and maintenance needs. Many of the challenges resulted in the local government refuse to accept the assets. More discussions on the challenges in the asset transfer will be presented in the following sections, grouped according to their similarities.

One of the main problems in the asset transfer process was due to the poor asset management capacity of the personnel involved in the process. Even though the lack of experience could be one of the reasons, PM01 argued it could not be used as an excuse, particularly since the mechanism had been stipulated in the national regulation and most of those involved were government officials who were supposed to know the regulation. One of the causes of this problem, as highlighted by PM05 was due to the fact that BRR personnel was recruited from different institutions which were frequently replaced and relocated. As he said

> *"(This was) because at that time the BRR recruited its personnel from various institutions. Then, the personnel were frequently changed. As a result, the administrative requirements was not well-maintained and inconsistent." – PM05*

Another issue raised by one of the interviewees was the poor asset management capacity due to the local governments' lack of interest to improve their system. With regards to using an asset management system, PM02 described how most local governments ignored the need to use the asset management system, and even ignored the offer to adopt the system in the first place. As PM02 said,

> *"The SIMDA (asset management software) system… honestly not everyone (the LGs) wanted to accept it. The early adopter was the major of Banda Aceh. He was the early adopter of SIMDA. The others, it was after we (BRR) were dismissed, some district asked 'please also make one for us'." – PM02*

In addition to the issue of asset management capacity, another problem causing delays in the transfer of assets was with regards to the method of valuating the assets. Explained by PM01, the asset valuation process escalated the asset transfer problem. First, the process of asset valuation might result in further delays. Second, the local governments did not have the capacity to do the asset valuation, nor do they have the budget to pay the consultant to do the valuation. Third, the valuation process may result in dispute due to the different values that might be given to an asset, as they were valued at different time. He explained

> *"When we were finished, the most difficult and time consuming (process) was the asset transfer. The transfer of asset to local governments was difficult. The local governments wanted that the assets to be revaluated, before they accept them. If they asked for*

revaluation, they would not sign the value which they did not think represent the current value at that time." – PM01

With regards to the cost and impact resulting from the asset revaluation process, PM01 argued

"The problem was, they also did not have money to (do) asset revaluation, to pay the consultant. (Even) if they appointed a consultant, the consultant would have different opinions (on the value). The project that we built was 100%, at the valuation time it had been (used) for several years. The consultant might appraise different value." – PM01

The next category of asset transfer challenges which resulted in the road maintenance neglects was due to the difficulties experienced in the project administration side. One of the main issues causing problems and delays in the transfer of reconstruction assets to the local governments was with regards to the completeness of the assets document. Additionally, as described by PM02, the local governments worked strictly in accordance with the formal rules and regulations, which therefore resulted in the maintenance neglect. As he illustrated

"It's like this, the government works based on formal norms. Even though I have occupied the building, but because the paperwork is not with me yet, I will not maintain the building." – PM02.

Interviewee PM02 further added that the absence of the formal paperwork resulted in the maintenance neglect.

"Indeed, formally the Local Governments would not grant maintenance allocation if the formal (paperwork) had not completed." – PM02

Supporting the PM02 comment on the formal paperwork requirement for the asset transfer, PM08 explained the problem as

"For us, after the final handover, since we had been covered by the MoU, we considered that the assets were the responsibility of the LGs… Because they had signed prior to project implementation. But what happened was, without official handover from the national government to the provincial government, and to district government, the local governments would have difficulties in allocating budget. So they could not make the budget request to the parliament." – PM08

He further showed his concern that it was the bureaucratic process which hindered the allocation of the maintenance budget.

> *"Those were the problems. Not due to unwillingness, but due to bureaucracy the (maintenance) fund was not approved." – PM08*

Likewise, PM02 argued that the legal process was the main challenges experienced in the process of transferring reconstruction assets back to the local governments.

> *"In my opinion, one of the biggest take-away (problem) was the legal process. The legal process of asset handover. For example, I am giving a car, the car has been possessed, but since the licence paperwork and car registration have not been handed-over, it has not actually been transferred, right?" – PM02*

With regards to the ownership status of road sections that have not been transferred to the LGs, PM03 explained that the roads belong to the national government. As he said

> *"Automatically it belongs to the central (government) because the status had been changed to state-owned property. State-owned property becomes district-owned property if the transfer has been accepted. But if it hasn't… they are still state's assets." – PM03*

Another challenge in the asset transfer process of road infrastructure assets included those due to the land registration and certification problem. As highlighted by PM02, the land registration and certification problem was due to the dependencies of the process on the national land management body (BPN) who has the authority to issue the land certificate. He said

> *"In this country, the one who has the authority to issue the land certificate is the BPN. Why they have not done, sometimes the reason is that it's just not done yet… just being relaxed. It happened." – PM02*

In addition to the administrative and legal requirements as the challenges to the asset transfer process, there was also problems due to the poor condition of the assets when the asset transfer process took place. In addition to road deterioration due to overloading traffic, PM09 also argue that the poor condition of the road infrastructure was also due to the lack of routine maintenance. He said

"Another issue… the maintenance needs to be done every year. Even if the construction (quality) is good, it still needs maintenance. Grass needs to be cut, cracks need to be repaired, right? (without maintenance) three or four years, it will be damaged." – PM09

He further argued that the local governments did not consider this matter. He further argued that when refusing to accept the road reconstruction assets, the local governments did not put into account the initial road condition prior to the tsunami reconstruction. He said

"They (the LGs) did not consider the initial condition of the construction. They only see that the roads are now damaged. Fix them first before I accept them. In fact, we did not build new roads. We reconstructed the existing road. We rehabilitated, we overlaid the existing roads." – PM09

The issue of poor road condition in the asset transfer process as discussed above was closely linked to the time gap between the project completion and the asset transfer process itself. The process of transferring the road infrastructure assets to the regional government generally took place at the end of the BRR period. Some assets were even transferred after BRR have been officially closed in 2009, regardless the project completion time. As a result, the maintenance of the assets between the project completion (i.e. the final handover of the assets from the contractor) and the transfer to the local governments were neglected.

PM02 further confirmed that the time gap between project completion and transfer of assets had been one of the main problems. He said

"The transition between (project completion) and handover of assets to the LGs, there was quite a long gap." – PM02

Additionally, PM09 added that some of the road reconstruction project was not finished by the end of BRR period and was therefore continued by the ministry of the public works. PM09 accordingly highlighted that during the gap, the roads were not maintained.

"They (the unfinished project) are all working beyond the BRR period. Imagine, during this time are they maintained? Actually, not. Who maintains them? We no longer have the authority. Legally we have no power. However, the assets have not yet been transferred." – PM09

The above section have provided an in-depth discussion on the challenges in the asset transfer process. The various issues in the asset transfer process, which eventually lead to the delays in the transfer process and maintenance neglect have been also been presented, covering the various views of the interviewees on the issue. The cognitive map of the challenges in the asset transfer process is presented in Figure 5.14 .

Accordingly, the following section will provide a discussion on the post-disaster road reconstruction success indicators as perceived by the interviewees at the national and the provincial levels.

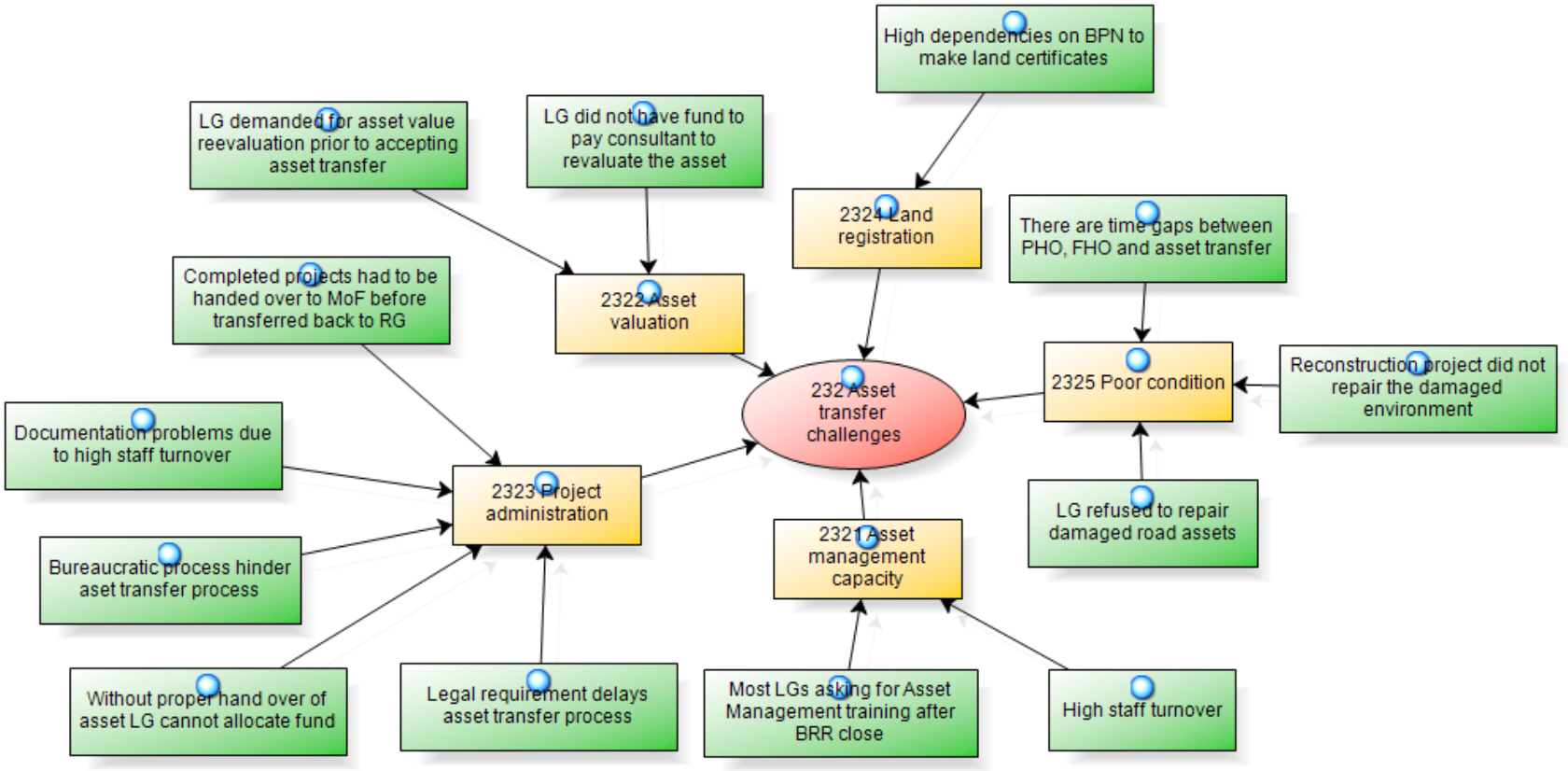


Figure 5.14 – Cognitive map of the asset transfer challenges

5.4.2.4 Post-disaster road reconstruction success indicators

This section will present the success indicators of the post-disaster road reconstruction. The indicators presented in this section were derived from the discussion with the high-level officials and policy maker interviewees at the national and the provincial levels. The success indicators are grouped in accordance to their similarities into three main categories, namely: disaster impact recovery, socioeconomic condition and improved road infrastructure condition. Each of these indicators will be discussed in the following paragraphs.

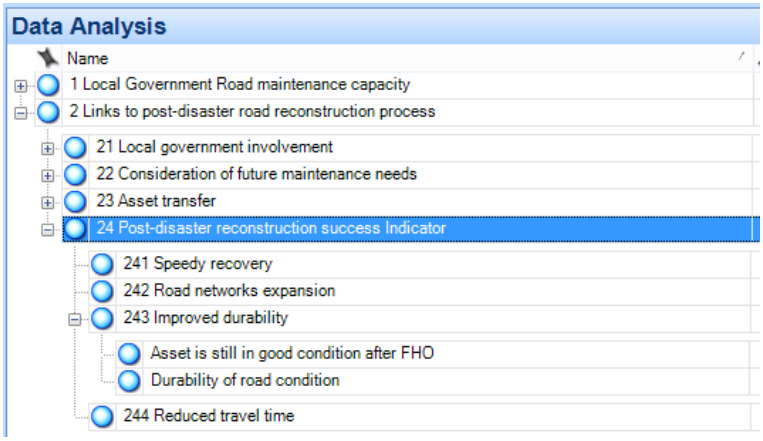


Figure 5.15 - The coding structure for the post-disaster success indicators

One of the success indicators of road reconstruction is with regards to the impact of the reconstruction on the recovery pace. The interviewees generally perceived that the reconstruction of road infrastructure has largely contributed to the speedy recovery of the tsunami affected areas. As suggested by PM05

"I see that the communities have rapidly recovered." – PM05

Furthermore, the reconstruction of road infrastructure resulted in more road reconstructed than destroyed. This means that on the one hand the reconstruction of road infrastructure helped reduce the maintenance backlog by rehabilitating or reconstructing the unaffected road sections. On the other hand, this also means that reconstruction of road infrastructure potentially gives extra burden to the local governments to maintain the road reconstruction

assets. Extending the scope of the road reconstruction to also include the unaffected road section was also doable due to the fund availability. As suggested by PM09, fund availability was used as an opportunity to implement the build back better principle. He said

> *"We (adopted) build back better (principle). What was damaged, we repaired. Then (as) we had spare fund, we extended beyond what was damaged. So we did not only restore the damaged (road sections) to the original condition, but also the coverage. The coverage was also wider than what was destroyed by the tsunami." – PM09*

He added

> *"So not only what was destroyed that we repaired… the build back better was (implemented) vertically and horizontally. Vertical means the quality is repaired, horizontal means the coverage is extended. That is why there are differences (between destroyed and reconstructed road length)." – PM09*

In addition to the length of the road sections repaired during the post-disaster reconstruction period, the quality of the reconstructed road was also believed to have better quality. As argued by PM08

> *"I considered (the road reconstruction) as successful. Because we assessed this ourselves. So when the projects were completed and after the contractors' defect liability period, we went around. The projects were still exist (and) in good condition." PM08*

He further added that the reconstructed road assets were generally in good condition.

> *"Roads that were built were still in good condition. Even though there were some small potholes, but with the maintenance fund that Local Governments (provided), the potholes were patched. They were maintained." – PM08*

PM08 view was also supported by, PM09, whom argued that in general the road are still in good condition. He said

> *"There are spots that we could not say 100% perfect, but they are relatively more durable than what is normally constructed… I received photos that there potholes, but generally they are still in very good condition." – PM09*

Another benefit of the road reconstruction activities was with regard to the reduced travel time to the tsunami affected areas. Such impact was raised by PM08 and PM05. PM08 described

"So far we have observed and proved that it was very beneficial. We did a survey to Aceh Jaya, Pidie, Bireuen, Pidie Jaya and Sabang. For instance, in Sabang, the community is now used to travel, from what used to take 5 hours can now be travelled in just half an hour." – PM08

Similarly, PM05 added

"If you want to go to Meulaboh, now it takes only 3.5 hours. No more rafts. Smooth." – PM05

The post-disaster road reconstruction success indicators have been discussed in detail in this section. Accordingly, the cognitive map of the success indicators is presented in the following Figure 5.16

This section provides in-depth discussion on the links and connections between the local governments' road maintenance capacity with the post-disaster reconstruction process. The issue of local governments' involvement, consideration of maintenance needs, asset transfer, as well as the post-disaster road reconstruction success indicator have been presented profoundly above. Accordingly, this section concluded the analysis of the semi-structured interviews with the high-level officials and semi-structured respondents and the discussion will therefore progress to the analysis of the case studies in the next section.

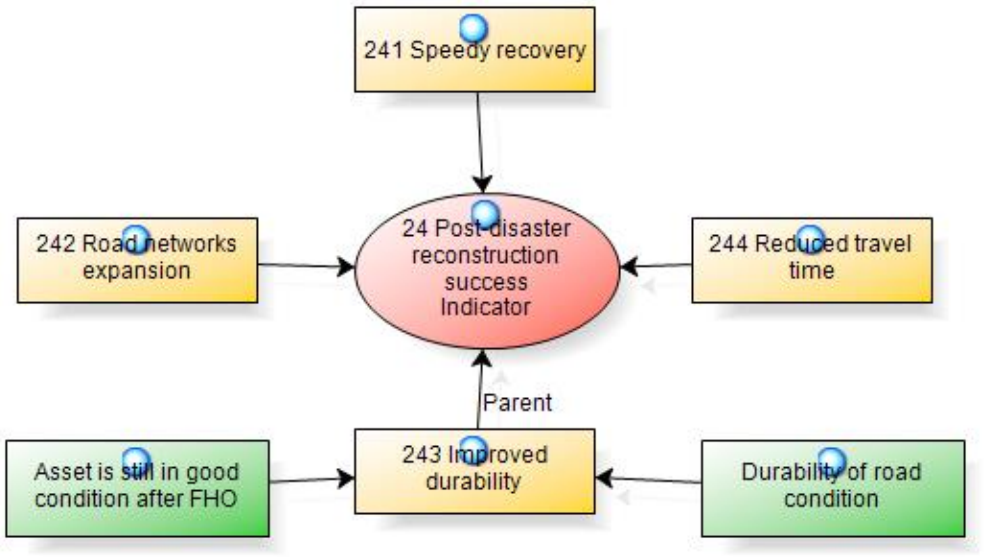


Figure 5.16 – Cognitive map of the road reconstruction success indicator

SECTION B – THE CASE STUDIES

This section presents the analysis of the case studies of the research. The process of the case study selection is discussed in section 3.3.3.3. Accordingly, the case studies of the research are the district of Aceh Besar, Aceh Jaya, and Aceh Barat Daya, three out of the 8 districts and cities in the west coast of Aceh province which were directly affected by the 2004 tsunami. The following section will accordingly provide background information about the case studies. The discussion will further progress to the analysis of each of the case study in section 5.7 (Aceh Besar), section 5.8 (Aceh Jaya), and section 5.9 (Aceh Barat Daya).

5.5 Background information

5.5.1.1 Case study 1: Aceh Besar District

The Aceh Besar district is located on the tip of Sumatra Island, surrounding the city of Banda Aceh. The northern part of the district is the Malacca strait, the city of Sabang and the city of Banda Aceh. In the western part, the border is the Indonesian Ocean. The area of Aceh Besar district also includes some islands in the Malacca Strait and the Indonesian Ocean.

Figure 5.17 – Map of Aceh Besar location

Source: Wikipedia

The population of Aceh Besar is 371,412 people, which are spread in 23 sub-districts and more than 600 villages. More details on the geographical information of the Aceh Besar district are presented in Table 5.2.

Table 5.2 – Geographical Information of Aceh Besar district

Description	*Remarks*
Location	***5.2^0 – 5.8^o North Latitude and 95.0^o- 95.8^o East Longitude***
Number of sub-districts:	***23 sub-districts and 604 villages***
Border	***North: Malacca strait, Sabang and Banda Aceh South: Aceh Jaya East: Pidie West: Indonesian Ocean***
Land Area	***2,974.12 km^2***

Source: BPS Aceh Besar (2013)

The district of Aceh Besar is governed by a Regent, locally called as a 'Bupati', which is elected through an election. The number of the civil servants in Aceh Besar is 7,605 personnel. More than 50% of the civil servants (4,147 personnel) are in the department of education, which mainly consists of teachers. From the political aspect, the parliament of Aceh Besar is dominated by the representatives of the Aceh Party, a local party which mainly consist of the ex-combatant or their supporters. The composition of the parliament members is presented in Table 5.3.

Table 5.3 – Composition of the Parliament Members as of 2009 Election

Fraction	*Number of Representatives*
Aceh Party	***10***
Democrat	***5***
PAN	***9***
Golkar Bulan Bintang	***6***
PKS PPP	***5***
Total	*35*

Furthermore, Table 5.4 presents the list of road projects implemented by the BRR during the post-disaster reconstruction project. As shown in the table, more than 63km of the district roads (including 170m of bridges) were reconstructed by the BRR.

Table 5.4 – BRR's Road Rehabilitation and Reconstruction Projects in Aceh Besar by 2008

Project Name	*Project Value (x1000)*	*Length (km)*
Jalan Desa Lamkeuneu-eu	***Rp 323,680***	***0.80***
Jalan Desa Lampisang	***Rp 314,750***	***0.80***
Jalan Lampuuk - Lamlhom - Lampulo	***Rp 2,709,611***	***4.00***
Jalan Tanjung Selamat Miruk Taman	***Rp 3,161,960***	***4.40***
Jembatan Alue Ateuk	***Rp 49,142***	***0.02***
Jembatan Alue Tho	***Rp 49,125***	***0.02***
Jembatan Krueng Kalak (12.6 m)	***Rp 780,000***	***0.01***
Jembatan Lam Jruen	***Rp 33,000***	***0.02***
Jembatan Lampadang - Lamteh (26.8 m)	***Rp 249,770***	***0.03***
Jembatan Lamsie (52.5 m)	***Rp 331,085***	***0.05***
Jembatan Maheng	***Rp 37,834***	***0.02***
Jl. Lampadang - Lamteh Lambadeuk	***Rp 4,267,831***	***3.10***
Jl. Lampineung - Miruk Taman	***Rp 3,129,950***	***3.70***
Jl. Pasar Lhoong - Umong Sirebee	***Rp 924,640***	***3.00***
Jl. Pasar Lhoong - Umong Sirebee, Cs	***Rp 7,739,866***	***7.30***
Jl. Siron - Cot Iri	***Rp 410,197***	***0.50***
Krueng Glumpang - Seunelop	***Rp 2,599,900***	***2.76***
Lambadeuk - Lampuuk	***Rp 6,322,727***	***7.20***
Lambaro - Krueng Mak	***Rp 5,690,453***	***4.50***
Lampeuneurut - Pk. Biluy - Sibreh	***Rp 4,377,272***	***5.00***
Pasar Lhoknga - Lampuuk, Cs	***Rp 2,388,113***	***3.00***
Sp. Cot paya - Miruk Taman - Sp. Lambitra	***Rp 3,066,322***	***3.13***
Jl. Lampulo-Lam lhom-Lampuuk,Cs	***Rp 4,100,105***	***5.40***
Peukan Bada-Ajuen-Bukit Kusumba-Mata Ie,Cs	***Rp 2,955,462***	***4.70***
Total	*Rp 56,012,795*	*63.46*

Source: Nugroho (2008)

The general road condition of the district road in Aceh Besar is presented in Table 5.5. As shown in the table, the road condition in the Aceh Besar district is described as 'fit' and 'damaged', instead of 'good', 'moderate', 'damaged', and 'heavily damaged' as it is now more commonly used in the other districts. Accordingly, the 'fit' category represents the road with good and moderate condition and the 'damaged' category therefore represents the damaged and the heavily damaged condition. Additionally, the length of the district road networks in Aceh Besar

increase substantially in 2009. This is particularly due to the upgrade of status of 385.5km from the village roads to the district roads.

Table 5.5 – District Road Condition in Aceh Besar (PU Aceh Besar)

Year	*District Road Condition**				*Total Length (km)*
	Fit (km)		***Damaged (km)***		
2006	***357.65***	***38.27%***	***576.85***	***61.73%***	*934.50*
2007	***383.65***	***41.05%***	***550.85***	***58.95%***	*934.50*
2008	***442.00***	***47.30%***	***492.50***	***52.70%***	*934.50*
*2009***	***574.20***	***43.50%***	***745.80***	***56.50%***	*1320.00*
2010	***610.10***	***46.22%***	***709.90***	***53.78%***	*1320.00*
2011	***662.50***	***50.19%***	***657.50***	***49.81%***	*1320.00*
2012	***693.40***	***52.53%***	***626.60***	***47.47%***	*1320.00*

**** Fit = Good + Moderate***
Damaged = Damaged+ Heavily Damaged
***** In 2009, the status of 385.5km of village roads were upgraded to district roads, increasing the total district road networks from 934.5km to 1320km.***

Furthermore, Table 5.6 presents the ratio of district roads with Hot Mix Asphalt surface type. As shown in the table, within the 6 year period between 2006 and 2012, the road networks with Hotmix surface increased from 242.7km to 638km, showing a trend of upgrading road surface to the Hotmix type.

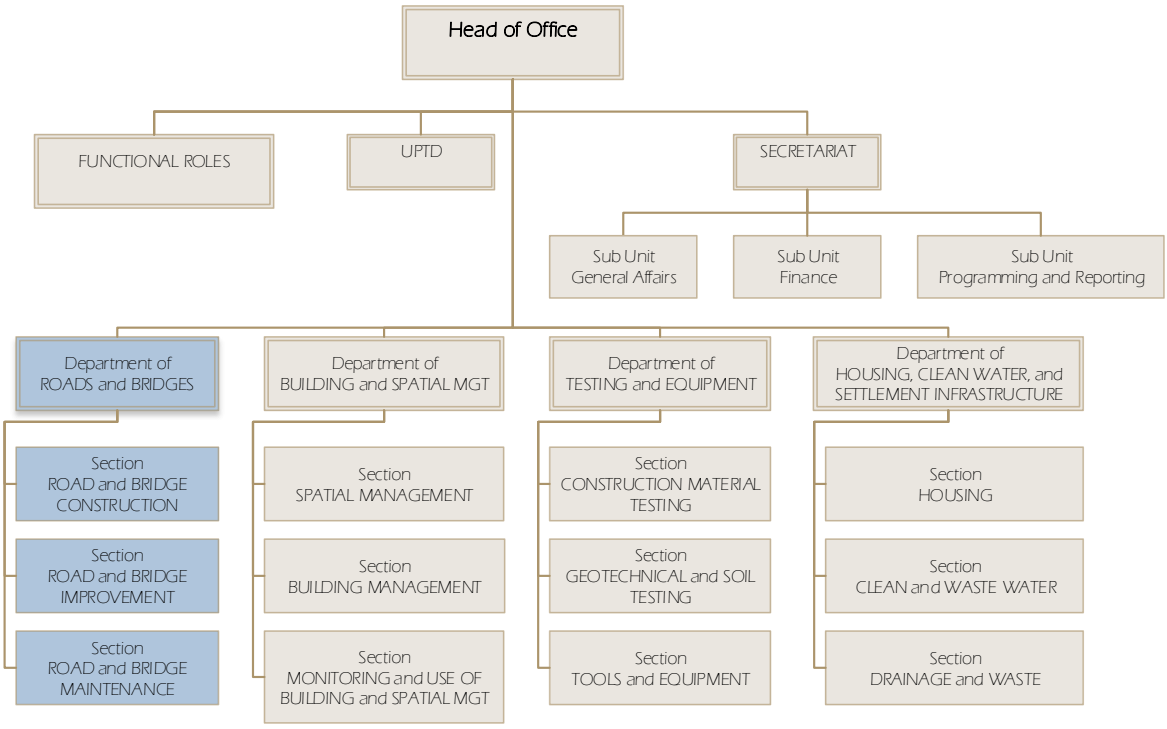
Table 5.6 – District Road Sections with Hot Mix Asphalt Surface)

Year	*Number of Road Sections*	*Length (km)*	*% of total road length*	*Total Road Length*
2006	***120***	***242.70***	***25.97%***	***934.50***
2007	***145***	***289.00***	***30.93%***	***934.50***
2008	***175***	***351.80***	***37.65%***	***934.50***
2009	***206***	***479.40***	***36.32%***	***1320.00***
2010	***228***	***534.90***	***40.52%***	***1320.00***
2011	***260***	***601.90***	***45.60%***	***1320.00***
2012	***269***	***638.00***	***48.33%***	***1320.00***

Source: PU Aceh Besar (personal communication)

The construction and the maintenance of the road infrastructure in Aceh Besar are managed by the public works agency. The public works agency in Aceh Besar is responsible for four main

tasks which are represented by the four departments in the agency. More detail of the organisational structure is presented in Figure 5.18. As shown in the figure, the road infrastructure is managed by the Department of Roads and Bridges.



http://www.acehbesarkab.go.id/page/Struktur-Pemerintahan/Dinas/Dinas-Bina-Marga-dan-Cipta-Karya/ids/62

Figure 5.18 – Organisational Structure of Road Authority in Aceh Besar

5.5.1.2 Case study 2: Aceh Jaya District

The district of Aceh Jaya is located in the west coast of Aceh province. The district is relatively new as it was separated from Aceh Barat district in 2002. In the northern part, the border is the Aceh Besar and Pidie district. In the western and the southern part the border is the Indonesian ocean.

Figure 5.19 – Map of Aceh Jaya location

Source: Wikipedia

The district has a high rainfall intensity where rain occurs in more than 160 days of the year with an average rainfall intensity of 270.4mm per month. The district of Aceh Jaya has a population of 78,540 people, which are spread in 9 sub-districts and more than 170 villages. More details on the geographical information of the Aceh Jaya district are presented in Table 5.7.

Table 5.7 – Geographical Information of Aceh Jaya

Description	*Remarks*
Location	***$04^0$22'-$05^0$16' North Latitude and $95^0$02'-$96^0$03' East Longitude***
Number of sub-districts:	***9 sub-district and 172 villages***
Border	***North:Aceh Besar, Pidie South:Indonesian Ocean, Aceh Barat East: Pidie, Aceh Barat West: Indonesian Ocean***
Land Area	***3727 km²***

Source: Bappeda Aceh Jaya (2012)

The district of Aceh Jaya is governed by a Regent, locally called as a Bupati, which is elected through an election every 5 years. Additionally, the number of civil servants in Aceh Jaya is 3,042 personnel. Similar to Aceh Besar, the parliament of Aceh Jaya is also dominated by representatives from the Aceh Party, a local political party highly influenced by the ex-

combatants. Fourteen out of the 20 parliament members in the district are from the Aceh Party. The composition of the parliament members, based on the fraction in the parliament is presented in Table 5.3

Table 5.8 – Composition of the Parliament Members as of 2009 Election

Fraction	*Number of Representatives*
Aceh Party	***14***
*Union**	***6***
Total	*20*

****The union fraction consist of representatives from several political parties***

With regards to the post-disaster road reconstruction, Table 5.9 presents the list of road projects implemented by the BRR during the post-disaster reconstruction project. As shown in the table, more than 40km of the district roads were reconstructed.

Table 5.9 – BRR's Road Rehabilitation and Reconstruction Projects in Aceh Jaya by 2008

Project Name	***Project Value (x1000)***	***Length (km)***
Alue Ambang – Panton	***Rp 2,581,580***	***2.7***
Batee Tutong – Simpang Tugu	***Rp 3,262,930***	***2.42***
Blang Dalam –Jemheuk	***Rp 3,661,729***	***5***
Jalan dalam Kota Calang	***Rp 5,000,000***	***3.08***
Jembatan Krueng Padang (80 m), oprit 1.334 m	***Rp 6,459,419***	***1.33***
Jembatan Kuala Bakong, 50 m	***Rp 4,563,636***	***0.05***
Keude Panga – Ujong Buloh, Batal	***Rp 6,809,090***	***7***
Krueng Tho- Mata ie Baru	***Rp 3,406,955***	***4.75***
Lamno – Sango	***Rp 3,602,625***	***3.9***
Jalan Lingkar Kota Calang	***Rp 11,178,416***	***10***
TOTAL	*Rp 50,526,380*	*40.23*

Source: Nugroho (2008)

Additionally, the general condition and the surface type of the district roads in Aceh Jaya are presented in Table 5.10 and Table 5.11. As shown in the table, most of the road sections in the district are either in good or moderate condition.

Table 5.10 – District Road Condition in Aceh Jaya (Bappeda Aceh Jaya, 2012)

Year	*Good*		*Moderate*		*Damaged*		*Heavily Damaged*		*Total*
2011	***192.1***	***35.2%***	***95.4***	***17.5%***	***104.8***	***19.2%***	***153.6***	***28.1%***	*545.89*
As of 20120									*540.78*

Table 5.11 – District Road Surface Type in Aceh Jaya (Bappeda Aceh Jaya, 2012)

Surface type	*Asphalt*		*Gravel*		*Dirt*		*Total*
2011	***202.77***	***37.1%***	***179.04***	***32.8%***	***164.09***	***30.1%***	*545.89*
As of 2010							*540.78*

The construction and the maintenance of the road infrastructure in Aceh Jaya are under the responsibility of the public works agency. The agency has five departments which are responsible for various tasks. The department responsible for the construction and the maintenance of the road infrastructure is Bina Marga. More details on the organisational structure of the public works agency is presented in Figure 5.20

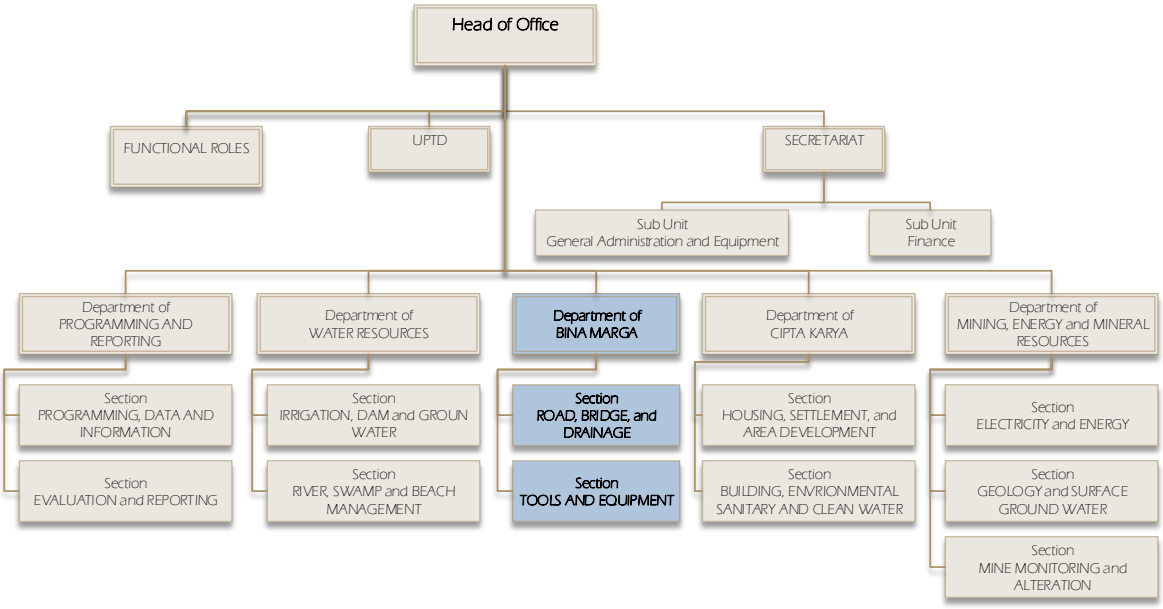


Figure 5.20 – Organisational Structure of Public Works in Aceh Jaya

5.5.1.3 Case study 3: Aceh Barat Daya District

The district of Aceh Barat Daya is located in the west coast area of Aceh province. Similar to Aceh Jaya, the Aceh Barat Daya district is a relatively new district as it was separated from the Aceh Selatan district in 2002. In the northern part, the border is Gayo Lues district and in the southern part the border is the Indian Ocean. As in 2012, the highest rainfall intensity was in November, with more than 476mm, while the lowest rainfall intensity was in July, with 123mm of rainfall.

Figure 5.21 – Map of Aceh Barat Daya location

Source: Wikipedia

The district of Aceh Barat Daya has a population of 131,087 (BPS Aceh Barat Daya, 2013). The population is spread in 9 sub-district and 152 villages. More details on the geographical information of the Aceh Barat Daya district are presented in Table 5.12.

Table 5.12 – Geographical Information of Aceh Barat Daya

Description	*Remarks*
Location	***$03^0$34'24" – $4^0$05'37" North Latitude and 96^o34'57" – 97^o09'19" East Longitude***
Number of sub-districts:	***9 sub-district and 152 villages***
Border	***North: Gayo Lues South: Indian Ocean East: Aceh Selatan West: Nagan Raya***
Land Area	***1882.05 km^2***

Source: BPS Aceh Barat Daya (2013)

The Aceh Barat Daya district is governed by a Regent, locally called as Bupati. The Bupati is elected every 5 years through an election. The number of civil servants in Aceh Barat Daya is 3628 personnel. From the political aspect, the parliament in Aceh Jaya consists of 25 members. Similar to other case study districts, the parliament is dominated by the representatives of the Aceh Party, with 18 members. The remaining 7 parliament members are representatives from various political parties which are included in the 'Pelangi' fraction in the parliament. The composition of the parliament members is summarised in Table 5.13

Table 5.13 – Composition of the Parliament Members in Aceh Barat Daya

Fraction	*Number of Representatives*
Aceh Party	***18***
Pelangi	***7***
Total	*25*

Additionally, the list of road reconstruction project implemented by the BRR in the post-tsunami reconstruction is shown in Table 5.14. As shown in the table, 11.23km of district road section was reconstructed in the district. This number is the least compared to other district included as the case studies.

Table 5.14 – BRR's Rehabilitation and reconstruction projects in Aceh Barat Daya district by 2008

Project Name	*Project Value (x1000)*	*Length (km)*
Guhang – Cot Mane	***Rp 2,000,000***	***0.8***
Jalan Guhang I	***Rp 3,198,020***	***0.8***
Jalan Lapangan Terbang, Cs	***Rp 2,608,717***	***1.25***
Jalan Lingkar Rawa Sakti, Cs	***Rp 4,040,000***	***3.5***
Jembatan Drien Leukit	***Rp 2,037,000***	***0.05***
Jl. Lingkar Terminal Blang Pidie	***Rp 2,621,220***	***2.83***
Pulau Kayu – Lama Muda	***Rp 2,085,378***	***2***
TOTAL	*Rp 18,590,335*	*11.23*

Source: Nugroho (2008)

The general road condition of Aceh Barat Daya district is presented in Table 5.15. As of 2012, most of the roads in the district were in good condition (1231.6km). Only less than 10% of the total road networks in the district are damaged. Additionally, the distribution of road surface type in the district is presented in Table 5.16. As shown in the table, more than 50% of the district road networks in Aceh Barat Daya are dirt road and less than 25% of the district road networks have been paved.

Table 5.15 – District Road Condition in Aceh Barat Daya 2012

Year	*Good*		*Moderate*		*Damaged*		*Heavily Damaged*		*Total*
2012	***1231.6***	***78.3%***	***192.13***	***12.2%***	***30.56***	***1.9%***	***119.14***	***7.6%***	***1573.43***
2011									***1557.83***
2010									***1338.73***
2009									***1316.75***

Source: BPS Aceh Barat Daya (2013)

Table 5.16 – District Road Surface Type in Aceh Barat Daya 2012

Year	*Asphalt*		*Gravel*		*Dirt*		*Total*
2012	***364.12***	***23.1%***	***321.07***	***20.4%***	***888.24***	***56.5%***	***1573.43***
2011							***1557.83***
2010							***1338.73***
2009							***1316.75***

Source: BPS Aceh Barat Daya (2013)

Furthermore, the responsibility to maintain the road infrastructure in Aceh Barat Daya is placed in the public works agency. In addition to road infrastructure, the public works agency is also responsible for the management of other type of infrastructure. More detail information on the organisational structure of the public works agency is presented Figure 5.22.

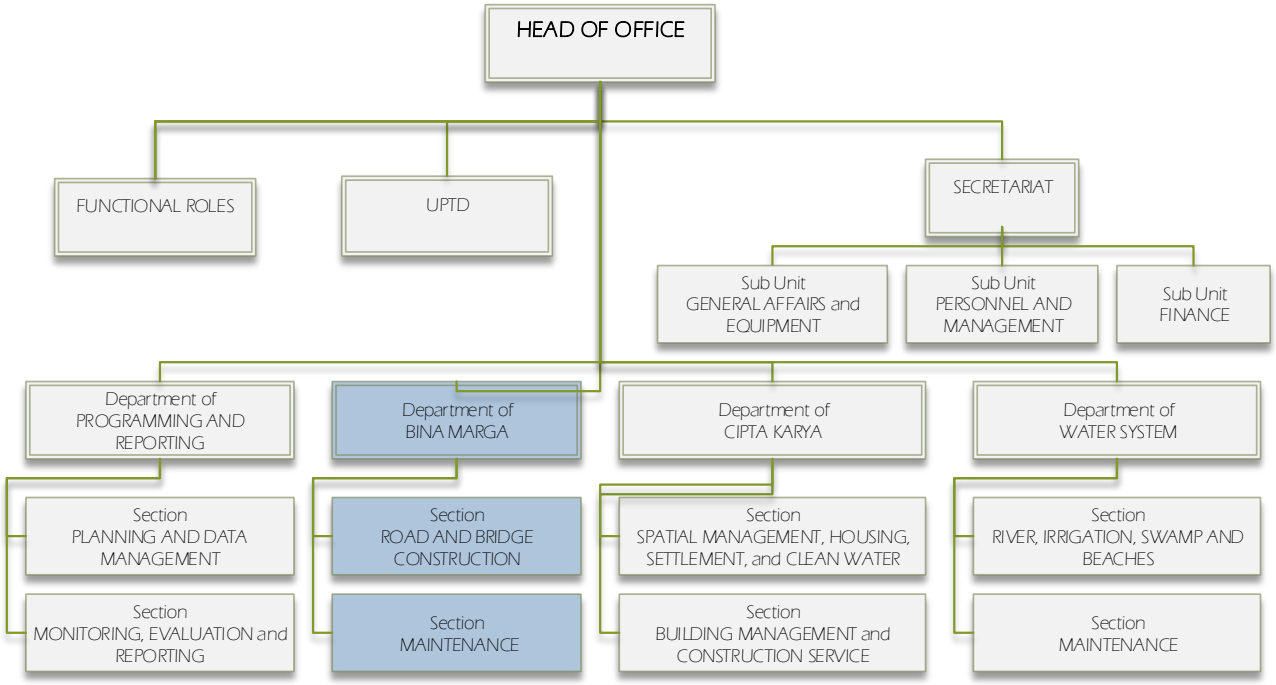


Figure 5.22 – Organisational Structure of Road Authority in Aceh Barat Daya

The background of the case study district has been described in the above sections. The background information is presented to provide a context for each of the case studies. Accordingly the following section will elaborate the analysis of each of the case studies.

5.6 Procedure of case study analysis

The case study analysis began by exploring the various key issues related to the local governments' road maintenance capacity as they emerged from the semi-structured interviews with the case studies' respondents. Semi-structured interviews were selected as the main data collection technique as it provides more flexibility and higher degree of freedom to communicate the respondents' perspective and answer the research question (section 3.3.6.2). The results of the semi-structured interviews were then transcribed manually using Microsoft Word Office 2013. Nonverbal indications seen from the interview process were also included as additional notes in the respective transcription. These transcriptions were then imported into the NVivo software and were attached to the recording files of each respondent. By importing the transcripts onto the recorded interviews, the researcher can easily play the

relevant interview section to confirm and recheck the wordings, tone and mood of the interviewees (more discussion on the content analysis method is covered in section 3.3.6.4).

With regards to the analysis process, the case studies began by exploring the factors affecting the capacity of the local governments in the maintenance of the road infrastructure. The affecting factors were identified as they emerged from the semi-structured interviews conducted with the respondents from the relevant case studies. The affecting factors were then classified in three groups, the external, institutional, and technical factors. Accordingly, the maintenance affecting factors of the case studies are presented in section 5.7.1, section 5.8.1, and section 5.9.1.

In addition to the affecting factors, the maintenance strategy or responses to the road maintenance issues were also identified using a similar approach. In this part, the approaches or strategies adopted by the local governments of the case studies towards the road maintenance issues were explored and discussed. The analyses of the case study maintenance strategies are presented in section 5.7.2, section 5.8.2, and section 5.9.2.

The next emerging issues were with regards to the capacity building initiatives within the case studies, responding to the road maintenance issues. The analysis covers the issue of capacity building approaches adopted in the case study local governments, as well as the challenges experienced in delivering the capacity building programs. The detailed discussion is presented in section 5.7.3, section 5.8.3, and section 5.9.3.

5.7 Analysis of case study 1 – Aceh Besar

5.7.1 The maintenance capacity affecting factors

5.7.1.1 External factors

The external factors for the road maintenance are those which are beyond the direct control of the road authorities. Accordingly, these external factors will be elaborated in the following sections.

5.7.1.1.1 Environment

The environmental factors affecting the road maintenance capacity of the local governments of Aceh Besar were with regards to the frequent landslide occurring in the area and the vast land area of the district. Explicitly stated by CS02, the landslide was seen as a challenge faced by the Local Government of Aceh Besar in maintaining the road infrastructure. As he said

> *"If the road construction is good, the (first) 5 year we don't need (to maintain). Maybe the shoulder (needs maintenance) as it will be peeled-off, as occasionally there are landslides." CS02*

In addition, the size of the district also affects the capacity of the Local Governments of Aceh Besar to monitor and maintain their road networks. According to the interviewees, the local government was struggling to maintain their local roads as the areas of the districts were too wide and the road networks to maintain were accordingly too extensive. As a consequence, the available budget was not sufficient for the maintenance of all the road networks. This view was expressed by CS03 by saying

> *"The government of Aceh Besar is overwhelmed. Why? We have so little budget... In fact, in our district, the district road alone is 1320km, just for the district road. Not to mention the village roads and neighbourhood roads, which are also under the Local Governments responsibility. Not to mention drainage channels. Not to mention bridges." – CS03*

Additionally, the Aceh Besar district consists of 23 sub districts which also includes some islands near the border of Banda Aceh. This condition gives the Local Government more challenges in monitoring and maintaining the road infrastructure. It appeared that the vast land areas and the extensive length of road networks led to frustration and reduced motivation in the Local Government personnel to maintain the road infrastructure. As the budget allocation for the road maintenance was very limited when compared to the actual needs, road maintenance works implemented by the Local Governments seemed to be unnoticeable. Such a frustration was also expressed by CS03. He said

> *"What we did was unnoticeable. We tried to find money from any sources. I also asked for assistance from the central (government)… But what we did was unnoticeable. We worked in Jantho, and all the money was spent there. And then we also worked in Saree. From Saree to Lengat was 16km. From Seulimum to Lamteuba was 33km. We also*

received Rp 19.6 billion. All was spent for the Seulimum to Lamteuba project, and not even 50% was completed." – CS03

The next section will accordingly, cover the political aspect as one of the factors affecting the road maintenance initiative.

5.7.1.1.2 Political

In addition to the environmental condition, the political influence appeared to be one of the factors affecting the capacity of the Local Government of Aceh Besar in road maintenance. The parliament's budgeting authority was argued to have affected the development planning and budget allocation for the road maintenance. Regarding the political influence in determining budget allocation for road maintenance, CS02 expressed that the political pressure in producing the annual budget proposal was very high. The budgeting authorities of the parliament, designed as a means to demonstrate and incorporate the community's aspiration in the development program, eventually affected the development planning. In practice, however, the parliament's budgeting authority resulted in budget proposal prepared by the government being scrutinised and forced to be modified according to the parliament's request. CS02 illustrated this process as

"When we make the proposal, we have to see that election zone 1 (for example) has been allocated Rp 5 billion, election zone 2 also a certain sum. We need to secure this and not to miss any single election zone. Otherwise the proposal will be jumbled. So it is a must." – CS02

Furthermore, on the one hand, it was acknowledged that the pressure from the parliament to disperse the development programs was necessary as a means to ensure the distribution of wealth. On the other hand, however, the pressure from the parliament would eventually affect the long-term planning since such pressure would recur every year, regardless what had been delivered in the previous year, and regardless whether or not it was considered as the development priority. CS02 further added that

"For example, election zone 2… has got relatively good road infrastructure… and in other places the road is damaged, but due to the equal distribution pressure, we need to put at least one project there (in election zone 2) even though it is not a priority." – CS02

He further added

> *"Since there needs to be some sort of distribution, which is pressurised by the parliament… we cannot build in the same place continually… They will later ask, why always build in A and why nothing in B; even though B is not a priority." – CS02*

A similar view was also expressed by CS01. With regards to the impact of the parliament intervention to the development plan, CS01 also expressed his disappointment and desperation with regards to the roles and use of development planning and programming produced by the planning agency. He further questioned the effectiveness of the development planning if it eventually depended on the political decision. He said

> *"Honestly, the Bappeda does not have the authority to intervene and delete programs (in the budget proposal). And even to propose the allocation we also do not have (the authority). Because, whatever the Bappeda produces, in the end it will go to the parliament (depend on the parliament)" – CS01*

As described by CS01, the Bappeda practically could not enforce and implement what were in their development planning and program unless they were approved by the parliament. As a result, the annual budget proposal did not necessarily reflect and represent the development planning which was produced by the planners, but rather filled with aspirations and demands from the politicians, which might and might not be in accordance with the development plan. In regard to this issue, CS01 further stated

> *"In the discussion of the budget, all of the aspirations are there. Everything is included. Even though the aspiration does not occur in the form of who owns this project or that project… they are blended into programs in the government agencies, but they have the notes, they know who proposed this and that project…" – CS01*

CS02 also added that such pressure had resulted in the reduction and diversion of road maintenance allocation to other low priority projects.

In addition to the above discussion, another impact of the local political condition to the road maintenance was the high preference on the capital project. Regarding this issue, CS03 suggested that this condition was affected by the great number of unpaved road sections. Consequently, he further said that spending the available budget allocation for the

maintenance of the existing road would not benefit those who lived in the unpaved road areas. Accordingly, upgrading the dirt roads was given a higher priority. More discussions on the social issue will be covered in the following section.

5.7.1.1.3 Socioeconomic factors

From the socioeconomic perspective, the road authority in Aceh Besar was also exposed to the pressure from the community to disperse road projects in different locations as a means of distribution of wealth. CS02 suggested that this condition was particularly due to the lack of knowledge of the community on the road maintenance concerns and the wider impact of damaged roads to the economy and road user safety. As explained by CS02

> *"The community will see it this way, why do the paved roads get paved again? Why is it always there? Whilst the puddle remains a puddle, the muddy roads remain muddy. They do not care if the road is narrow and insufficient for the current traffic; that it may lead to accidents, or else." – CS02*

Another main point emerged from the interview was that at the national level the maintenance of road infrastructure gets a high priority. The national government recognises the impact of poorly maintained roads to the economy. However, it was suggested that this view was not well grasped by the regional governments. At the regional level, the maintenance of the roads seemed to get a low priority. CS04 summarised this condition by arguing that this view was affected by the fact that there were many unpaved roads at the district level.

> *"The problem is… they are using different viewpoints. At the national level, maintaining road is important… at the provincial level, it is less (important). Particularly roads located a bit far inside, they are poorly maintained. At the district level, they are far less (maintained)… Why should we maintain this road whilst the unpaved road sections are still so abundant? That's how they see it." – CS04*

CS03 also expressed that the Local Government was overwhelmed, particularly as the unpaved road in the district was more than 50% of the overall networks. As he said

> *"… The Local Governments is overwhelmed to maintain (road infrastructure). The unpaved roads themselves are more than 50% in Aceh Besar." – CS03*

Additionally, CS02 further expressed that there was also another issue with the community, particularly with regards to their sense of ownership to the road infrastructure in their areas. CS02 suggested that the community awareness on the importance of the road infrastructure in their neighbourhoods had not been very well. CS02 added

> *"Apart from the financial issue, community awareness is also not very good. When there are small potholes, they do not immediately patch them. They can actually do it, can't they?" – CS02*

He also explained how the social custom of the society contributes to the rapid deterioration of the road infrastructure. He explained

> *"When they clean their rice paddy, the grasses are abandoned along the road, mostly on the road shoulder… Later on when they need to plough the rice paddy, this (road shoulder) is already filled with grass, and they will not clean it. "– CS02*

He further explained that efforts had been done to educate the community regarding the importance of road maintenance. He reasoned that due to the many unpaved road networks and the vast area of the district, it would take a long time before the government could afford to repair the damaged road. However, the bad practice seemed to remain. He said

> *"I told them, if the roads get damaged, it may take more than 10 years before the government can repair them because the area of Aceh Besar is so big. With 604 villages, if annually we can deal with 20 villages, they need to queue for 30 years. But they do not care." – CS02*

In addition to the pressure from the community to distribute project locations and their lack of sense of ownership, the road authority in Aceh Besar seemed to undermine the importance and the economic benefit of maintaining the road infrastructure, particularly when it is compared with the development of the new roads. For instance, CS02 suggested that the economic impact of building and expanding the road networks would have greater benefit than holding back the development due to the lack of maintenance capacity. He further argued that as long as the maintenance works could be delivered on time, the road maintenance will not be a problem. As CS02 stipulated

"The benefit will be greater if we build a lot (of road sections) than to be scared of the maintenance needs. Maintenance needs is not that big. The important thing is that we come when it is required." – CS02

Moreover, corruption also appeared to be experienced in the case study district. As described by CS07 also, corruption also occurred in the implementation of road maintenance works using the force-account method. CS07 suggested that by using the force-account method, the public works does not need to make tender document and use the consultant services as the works may be provided by themselves, and supervised by themselves. However, CS07 indicated that it was through the utilisation of the force-account method that the project managers at the public works agency get their 'extra income' apart from the contractors. As he said.

"The force-account project is different. They have separate allocation, they don't use consultant… They have their own budget, they do it themselves, and they supervise it themselves. Normally, that is the project managers' "project". If they (the project managers) don't get it from the contractors, then it's from there they got the money." – CS07

This section elaborates the socioeconomic factors the Local Governments' activities on road maintenance. Accordingly, the section will continue to discuss the safety and security aspect as one of the main contributing factors affecting the Local Governments' road maintenance capacity.

5.7.1.1.4 Security and safety

From the security and safety aspect, the impacts of conflict were also experienced in Aceh Besar. Another form of threats to the security and safety in the road construction project was the collection of 'security fee' by the ex-combatant. The security fee, locally known as *'Pajak Nanggroe'* or translated as the state tax, is the practice commonly experienced during the conflict. At that time, as the GAM was considered as a separatist group and fought in a guerrilla method, the collection of *'Pajak Nanggroe'* was done to fund their movement and was performed covertly.

After the peace agreement, the 'Pajak Nanggroe' turned into a security fee and charged by certain groups of communities or individuals, and must be paid by the contractors, which could

otherwise result in project disruptions. Even though the practice has now posed less serious threats as it used to be, the collection of *'Pajak Nanggroe'* seemed to be conducted more openly and widely by the ex-combatant individuals. As CS06 expressed, this practice was commonly experienced in the construction project sites and was normally solved by giving them a relatively small amount of money and was therefore not considered as a big problem

Whilst the above discussion indicates the security and safety issue posed by the community or individuals, there appeared to be security issue posed by the contractors. Another issue emerged in the interviews was with regard to the challenges experienced by the consultants in performing supervision tasks in a road project. CS07 explained that security and safety threats was also felt by the supervision consultant coming from the contractors. CS07 expressed that in that situation, personnel safety and security on the construction sites became the highest priority. As he said.

> *"For me personally, what is important is that I am safe." – CS07*

He further described that the level of security and safety threats in doing the supervision tasks depended on the supervision personnel's capacity and ability to adapt to the situation and respond to the threats. He advised that such a threat would frequently require relaxed supervision. He further added that being too strict on the construction specification may put them in danger.

On the other hand, however, CS02 suggested that after the peace agreement was in place, which means that the prolonged conflict had come to an end, the public work agency was then able to deliver and implement projects in the remote areas. Some of the dangerous areas, commonly referred to as "black" and "grey" areas, were untouched during the conflict time due to the security issues. CS02 said

> *"Before peace (agreement), it was difficult for us to go to the field. There were certain areas that we could not reach. The 'black' and 'grey' areas were bothersome. If we went there, we could be kidnapped… They had a conflict with the government, and we, the government employees, were considered as the government." – CS02*

During the conflict, due to the security issue, CS02 suggested that the remote areas were simply abandoned from the development. The government could only implement projects in the busy areas where project activities could be safely monitored.

After the peace agreement, however, the project implementations were not completely free of disruptions. As suggested by CS03, the road project implementation in Aceh Besar also experienced various disruptions and was accused to be linked with the post-conflict condition. CS05 shared his view that the community living along a road project frequently disturbed the contractor by proposing an unreasonable request. He described this situation as

> *"They didn't consider it as their public property, but they had personal interests. They wanted to raid money for their personal interest. Meanwhile the road project was for the benefit of the community. But due to their personal interest, the project was then abandoned." – CS05*

This view was also supported by CS02, who suggested that after the peace agreement, the ex-combatant returned to the community and started to rebuild their live through various means. However, as highlighted by CS02, some of the returning ex-combatants who worked as contractors forcefully tried to win construction projects in the disreputable way. He explained that whilst during the conflict threats and project disruptions were done covertly - as the combatant could not appear in public openly, after the peace agreement the disruptions were done more openly. Nevertheless, he also admitted that the peace agreement, however, has made reaching the remote areas possible. As he said

> *"After the peace agreement, we have access to all areas. Even the remote areas we can now touch and we can open access." – CS02*

Supporting the above views, CS01 also expressed that the peace agreement have provided better security assurance for non-local people to work in Aceh, allowing the local people to learn and broaden their views through the knowledge exchange.

5.7.1.1.5 Inter-organisational relationship

One of the issues emerging from the interviews regarding the inter-organisational relationship between the government and the private institutions is regarding the installation of public

infrastructure such as telecommunication cable and water pipeline. The installation of pipeline or telecommunication cable works often include excavation of the road structure along the shoulders as well as the main body of the road for the crossing work. However, the installation company frequently ignored the need to restore the affected road structure. CS03 told

> *"That is also a problem. The water company always digs the road side, the road shoulder. When they dig, it causes the roadside to rut. And after they dig, they do not restore them. They hoard the holes, but they are not compacted… This is why the roadside deteriorates rapidly." – CS03*

There seemed to be a lack of proper coordination between these agencies, and more importantly, lack of mechanism for the monitoring of the non-government institutions' activities affecting the road infrastructure. When asked if the public work agency have the authority to act on the misconducts of the aforementioned companies, CS02 suggested

> *"No. They are vertical institutions… They are not part of the local government… There should be one who coordinates this… It should be more controllable actually." – CS02*

The explanation of CS03 and CS02 suggested that the lack of coordination or authority to coordinate and control such activities resulted in the more rapid deterioration of road infrastructure. Even more, the public works as the appointed agency for the road maintenance seemed to refuse any responsibility of the impact of such practice as it was outside their authority.

Another inter-organisational relationship issue was raised by CS01. In addition to the conflicting roles in the road management between public works and the department of transportation (section 5.4.1.1.1.4), conflicting or unclear division of responsibilities was also identified between the planning agency (Bappeda) and the public works with regards to the road infrastructure development planning. As summarised by CS01 in the discussion of the road infrastructure planning procedure, he said

> *"We cannot delete (programs), but we coordinate. Frankly, Bappeda do not have the authority to intervene or delete programs. Only to coordinate. Even for the allocation of budget, we also don't have (authority)." – CS01*

The CS01's explanation above regarding the practice in the road development planning process was in fact contradictory to the planning process as described in the Government Regulation no 8/2008 (Government Regulation, 2008). The regulation stipulates the steps and processes of district development planning and emphasises the authority of the Bappeda as the agency responsible to prepare the final draft of the development work plan (Paragraph 22 article 1 and 2).

The external factors affecting the capacity of the local governments in the maintenance of road infrastructure have been elaborated in this section. The cognitive map of the external factors is presented in Figure 5.23. Accordingly, the next section will present the analysis of the institutional factors.

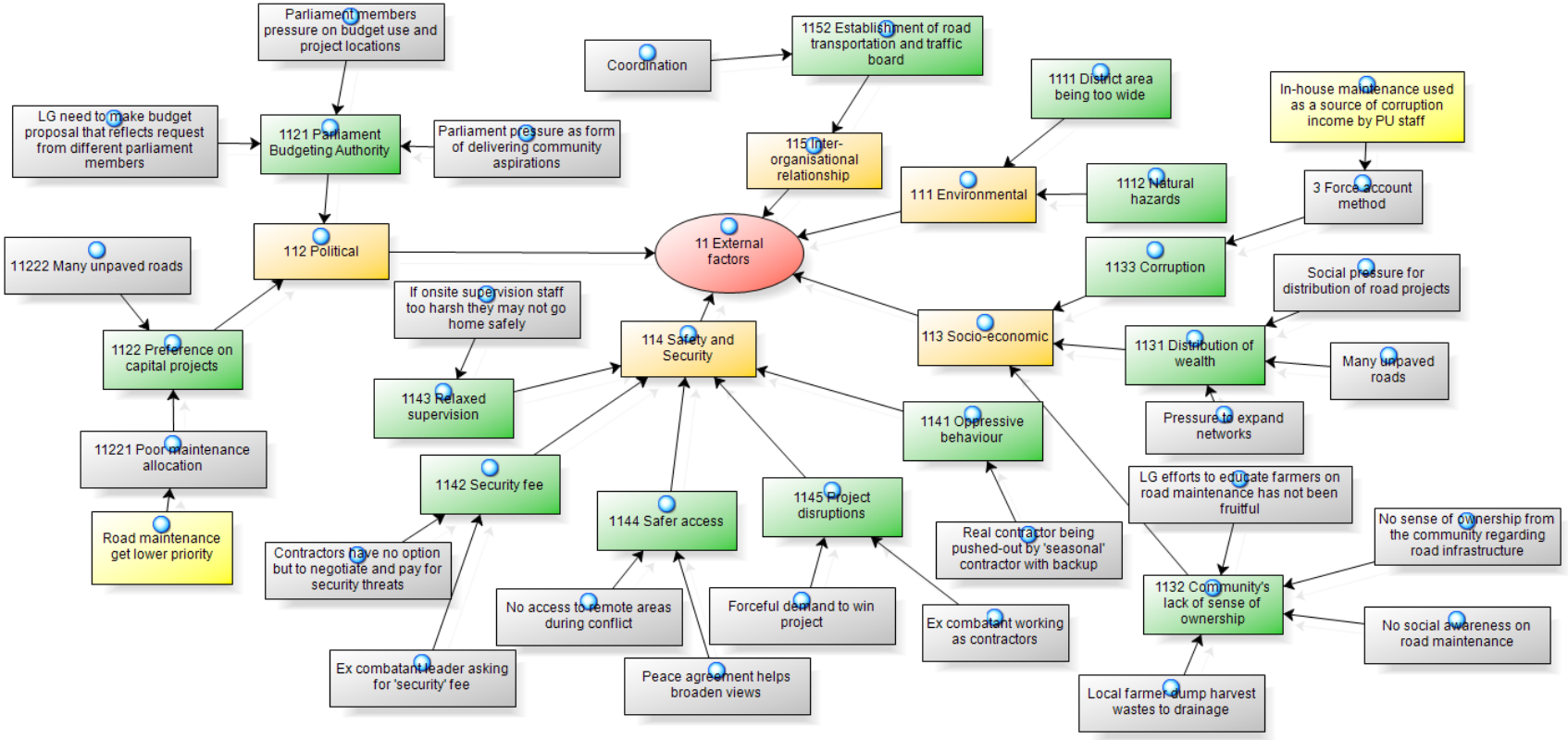


Figure 5.23 - Cognitive maps of the external affecting factors of case study one

5.7.1.2 Institutional factors

The next category of the factors affecting LG's road maintenance capacity is the institutional factors. These are factors which are under the authority and direct control of the road authority. The first institutional factor is regarding the financial management capacity, which will be discussed in the following section.

5.7.1.2.1 Financial management

The financial issues of road maintenance in Aceh Besar emerging from the interviews can be grouped into four categories. The categories are: fund is not allocated in sufficient amount, fund allocation is not spent, fund allocation is not spent effectively, and fund allocation is not spent efficiently.

5.7.1.2.1.1 Fund is not allocated in sufficient amount

The first financial issue in Aceh Besar was that the budget allocation for the road maintenance needs was not allocated in sufficient amount. This was expressed by CS02 as one of the main problems of road maintenance. Frequently, the road maintenance needs lost their priority over other needs. CS02 also expressed that even within the infrastructure sector road maintenance needs were given lower priority. CS02 described

> *"The fund needs to be shared (with other programs). There are several (other) programs that need to be included because we are public works. The fund can't be all used for roads only. We need to make drainage channels, we also need to include housing repair even though in small amount." – CS02*

As also expressed by CS04, the maintenance of the district roads seems to receive insufficient allocation and was frequently neglected. He said

> *"The road at the district level indeed becoming a problem. Let alone the road that we built for them, they do not even maintain the road they built. Due to the limited fund availability, or else. Or the parliament does not see it as an important agenda." – CS04*

Whilst on the one hand the limited budget allocation for the public works need to be distributed to various public infrastructures, on the other hand the budget allocation for road maintenance was not sufficient for the maintenance of the district roads. As expressed by CS03, the limited

budget availability was the main problem in road maintenance. He further said that the available allocation was only sufficient to rehabilitate less than 50km of roads. As he said

> *"The fund is not available. Last year we had Rp 70 billion, maximum. From that we can use it for (the maintenance of) roads of around 30-40km. (Including) the financial aid from the central government. – CS03*

The annual road maintenance allocation in the Aceh Besar district is presented in Table 5.17. As shown in the table, the average annual allocation for the road maintenance is approximately Rp 11 billion. Since there are more than 1300km of district road networks, the budget allocation for the maintenance is accordingly less than Rp 9 million (£450) per km per annum.

Table 5.17 – Road Maintenance Budget Allocation in Aceh Besar

Year	*Public Works Total Budget Allocation*	*Road Maintenance Allocation*	*Ratio***
*2006**	***Rp 44,272,131,891***	***Rp 8,726,468,000***	***19.71%***
*2007**	***Rp 45,571,548,978***	***Rp 12,161,285,400***	***26.69%***
2008	***Rp 45,940,289,250***	***Rp 13,830,778,500***	***30.11%***
*2009**	***Rp 36,817,813,750***	***Rp 11,770,690,000***	***31.97%***
*2010**	***Rp 65,325,518,134***	***Rp 8,868,782,500***	***13.58%***
*2011**	***Rp 40,456,360,206***	***Rp 11,409,435,000***	***28.20%***
*2012**	***Rp 57,445,912,245***	***Rp 14,403,875,000***	***25.07%***
Average annual allocation		*Rp 11,595,902,057*	

Source: DPPKA Aceh Besar
****Amended annual budget allocation, 2008 budget did not have amendments***
*****Ratio of maintenance budget allocation over the public works total budget allocation***

However, regarding the financial sufficiency, there was also a concern whether the annual budget was being used optimally. In the discussion about budget sufficiency for the maintenance of district roads, CS04 suggested that the problem of road maintenance in the district was not rooted in the districts' budget sufficiency but rather in the process of setting up of development priority.

5.7.1.2.1.2 Fund allocation is not spent

The renowned poor capacity of local governments in spending their annual budget was also experienced in Aceh Besar. As CS06 also argued, the financial resource adequacy was not in fact a problem in Aceh. He based his view that every year the local governments had not been able to spend their budget allocation and that a large amount of the unspent budget had to be returned to the central government. As shown in Table 5.18, the annual budget of the Aceh Besar district was commonly left unspent.

Table 5.18 – Annual Budget Realisation of Aceh Besar

Year	*TOTAL INCOME*	*TOTAL EXPENSES*	*REALISATION*	*UNSPENT ALLOCATION*
2006	***Rp 432,211,870,000***	***Rp 432,176,360,000***	***99.99%***	***Rp 35,510,000***
2007	***Rp 545,858,299,177***	***Rp 497,480,088,694***	***91.14%***	***Rp 48,378,210,483***
2008	***Rp 602,632,001,941***	***Rp 544,592,368,898***	***90.37%***	***Rp 58,039,633,043***
2009	***Rp 595,937,911,496***	***Rp 527,754,711,205***	***88.56%***	***Rp 68,183,200,291***
2010	***Rp 625,875,949,325***	***Rp 569,225,389,127***	***90.95%***	***Rp 56,650,560,198***
2011	***Rp 713,223,930,627***	***Rp 685,192,004,199***	***96.1%***	***Rp 28,031,926,428***
2012	***Rp 824,630,426,428***	***Rp 759,904,000,000***	***92.2%***	***Rp 64,726,426,428***

Source: DJPK (2014)
Note: £1 ~ Rp 20,000

As shown in Table 5.18, with the exception of the year 2006, the budget realisation rate in Aceh Besar had been approximately 90% of the total income. On average, the unspent budget allocation worth approximately Rp 50 to 60 billion. Not only do the unspent budget need to be returned to the central government, the budget of the following fiscal year might need to be adjusted and reduced to reflect the actual budget expenditure capacity of the respective district governments.

One of the causes of the unspent budget was the delays in the approval of the annual budget proposal. Section 2.5.5.1.3 summarises that delays in the annual budget approval were commonly experienced in Aceh. Accordingly, the budget expending period was shortened as it would need to be expended by the 31st of December of the running year, regardless the time the budget was approved and the time the local governments were starting to use it. Consequently, the delays in the budget approval also mean that the road infrastructure project

may not start according to the initial schedule and that the projects frequently have to be implemented in the rainy season. As CS06 concluded

> *"If (project starts) on April, according to the plan, there won't be a problem… unless if we start working at the end of the year, during the rainy season. That is the only problem. Because the base work takes time." – CS06*

The above discussions conform to the report of the ADB about road maintenance in Asia. The ADB (2003) suggests that road agencies in Asia are typically allocated only 40% of the maintenance needs (insufficient allocation issue) and that the actual disbursement were often much less (unspent budget allocation issue).

5.7.1.2.1.3 Fund allocation is not spent effectively

The next category on the financial management issue is that the allocation for the road maintenance is not effectively spent. This issue relates to the capacity of the local government, in this case the public works agency, in spending the budget allocated for the road maintenance in an effective manner.

The ineffective use of road maintenance budget allocation was seen in Aceh Besar. As expressed by CS02 the local government did not allocate budget for the routine maintenance. Hence, the immediate needs of routine maintenance works were simply neglected and delayed until the road sections would require rehabilitation. The CS02's comment was supported by CS03. He highlighted

> *"When we see the road has been damaged, then we will repair." – CS03*

In addition to the road maintenance neglect, CS02 also explained that the limited budget also led to providing improper road maintenance interventions. Consequently, the budget allocation spent for such interventions was virtually wasted. CS02 illustrated two examples of ineffective maintenance interventions. First, he suggested that due to the limited fund, damaged roads would only get potholes repaired and the cracks on the surface would be accordingly left untouched. Patching potholes would indeed help reduce risk of accident to the road users and somewhat reduce the road deterioration rate. However, leaving the cracks opened would allow water ingress and would soon result in new potholes and structural

degradation. Secondly, CS02 described that due the limited funding availability the public works occasionally provide routine maintenance interventions to roads which actually required periodic maintenance or rehabilitation works. He said

> *"We used to include road sections which no longer appropriate for routine maintenance to be in the routine maintenance work list because to perform the period maintenance the fund was not available." – CS02*

He further described the condition of roads receiving the routine maintenance as

> *"These roads were not only having holes, the asphalt can no longer be seen. How can we do routine maintenance on them? The routine maintenance supposed to be patching potholes… but when the roads have been totally peeled off, heavily damaged, they are not supposed to get routine maintenance, but periodic maintenance or (surface) upgrade instead. But since the fund was not available, it was eventually included (in the routine maintenance)." – CS02*

5.7.1.2.1.4 Fund allocation is not spent efficiently

In addition to the aforementioned financial issues, inefficient budget expenditure was also experienced in Aceh Besar. CS01 suggested that the approved allocation for the public works must always be allocated for the agency's indirect expenditure prior to distributing it for the development activities. As he explained

> *"(From the total allocation), we also see how much of the allocation is spent for indirect expenditure. This includes salary. How much for the salary, and the remaining amount is for the construction, grant, and other necessities." – CS01*

His comment on the poor distribution of budget allocation expenditure was also worsened by the poor capacity of the road authority personnel. More discussion on the personnel capacity will be presented in the following section regarding human resource.

5.7.1.2.2 Human resource

In Aceh Besar, the human resource capacity was also found as a problem in the road maintenance effort. CS02 specifically revealed that the technical capacity of the agency's personnel was poor. One of the causes of the poor capacity was due to the poor recruitment

system. CS02 revealed that many of the agency's personnel were children of the retiring personnel who were recruited as a good gesture of the agency to honour them. He explained

> *"So, a lot of the employee at the branch offices replaced their parents. They do not necessarily have engineering skill, even though the parents were technicians. As the kids graduated from high school they were then accepted and work to replace their parents." – CS02*

He further suggested that the poor recruitment system consequently resulted in the agency having more non-technical personnel than the technical ones.

> *"So if we look at the composition of the public works employee… there are more non-technical personnel than the technical ones. It should not be the case for a department this big." – CS02*

The poor recruitment system and consequently the poor capacity of the agency personnel were also worsened by the fact that many of the personnel were at the same time students in the university. Additionally, CS02 argued that he doubt that these personnel were seriously studying to pursue their degree and suggested that they were just looking for the qualification certificates, indicating the unlikely improvement they would give to the capacity problem. He said

> *"And then, how can I put this, maybe they are studying in college while working, or working while studying… How can they study? I mean, they also do not study seriously. We can see the difference between those who really study and those who work while studying or study while working. They are just looking for the certificate. Troublesome." – CS02*

The above discussions on the human resource issue raised by CS02 are particularly related to the capacity of the human resource in Aceh Besar with regard to the preparation of the road maintenance work plan. For the execution and the implementation of the maintenance works, CS03 suggested that the district of Aceh Besar did not face any technical problems. This was expressed by CS03 by saying

> *"There is no technical problem. We've never had problems in the implementation, whether during the BRR reconstruction period or after BRR. Ever since I am in the public*

works there has been no (technical) problem. Everything (all projects) is completed. Whatever allocation is available, we can finish (the project)" – CS03

5.7.1.2.3 Planning capacity

The next institutional factor affecting the road maintenance capacity was the capacity of the road agency to prepare the maintenance work plan. In addition to the local governments' commitment to the road maintenance, there was also an issue about the quality of the road infrastructure maintenance plan produced by the local governments. As revealed by CS06, the local governments were too much focused on the physical structure of the road construction but neglecting the supporting infrastructure such as drainage and road shoulder. CS06 concluded

"They prepare only the road construction, but the supporting infrastructure is ignored. I mean, it is not prepared together with the road construction." – CS06

In Aceh Besar, the road agency faced a great challenge in the planning of the road maintenance works due to the lack of proper road information system. As a consequence, the road agency could not know in advance which road sections would need maintenance interventions and accordingly could not produce a reliable maintenance needs estimate. CS02 revealed

"But also we do not have information due to the wide area. The problem is that we do not have accurate information which sections need maintenance. It is also a challenge." – CS02

Due to the lack of information on which road sections require maintenance intervention, the quality and reliability of the maintenance work plan were accordingly questionable.

5.7.1.2.4 Organisational management

Organisational management relates to the capacity of the local government on the managerial aspect of their internal organisation. The first issue emerged in this category was the leadership. CS01 brought up his concern that the emotional bound of the head of the governments or the road agencies was the most influencing factor in the decision making. CS04 also suggested that the process of determining road project locations was also spoilt by the conflict of interests of the local government officials. He said

"The challenge was that too many road projects were forcefully requested to be done in certain locations… Why do they have to be there? After we did field observations, we found that there was the house of the head of parliament, or it was the Bupati's village. That happened." – CS04

Furthermore, he also suggested that such information was frequently found out during the construction process, when it was too late to make any changes. Concluding the above arguments regarding the influence of leadership in determining the project location, it was becoming apparent that whilst on the hand the political pressure from the parliament members was seen as a disruption in determining budget allocation and project locations, on the other hand the emotional bound of the head of government and agencies was also seen as a disruption to determining the location of road maintenance projects. CS01 further suggested that even though such condition was difficult to prove, the unbalanced distribution of the projects was felt widely.

"So, they directed the projects to their hometown, some of them… even though we cannot prove it, but everybody feels the unbalanced (distribution)." – CS01

Another concern emerging on the leadership issue was with regard to the attitude of the head of the governments. It was suggested that the local governments tend to rely their development programs on the financial aid from the external sources such as from the provincial or the national government. For the maintenance of the post-disaster reconstruction assets in the district, Aceh Besar submitted a proposal to the national planning agency for the maintenance budget assistance. CS02 said

"We have proposed to the Bappenas, that for the assets from BRR that have been handed over to the Local Governments, there should be maintenance allocations from the central government." – CS02

The above discussion on the organisational aspect of the road maintenance capacity concludes the institutional factors affecting the road maintenance capacity in Aceh Besar. The cognitive map of the institutional affecting factors is presented in Figure 5.24. Accordingly, the following section will start to elaborate the technical factors which affected the capacity of the Aceh Besar government in maintaining their road infrastructure.

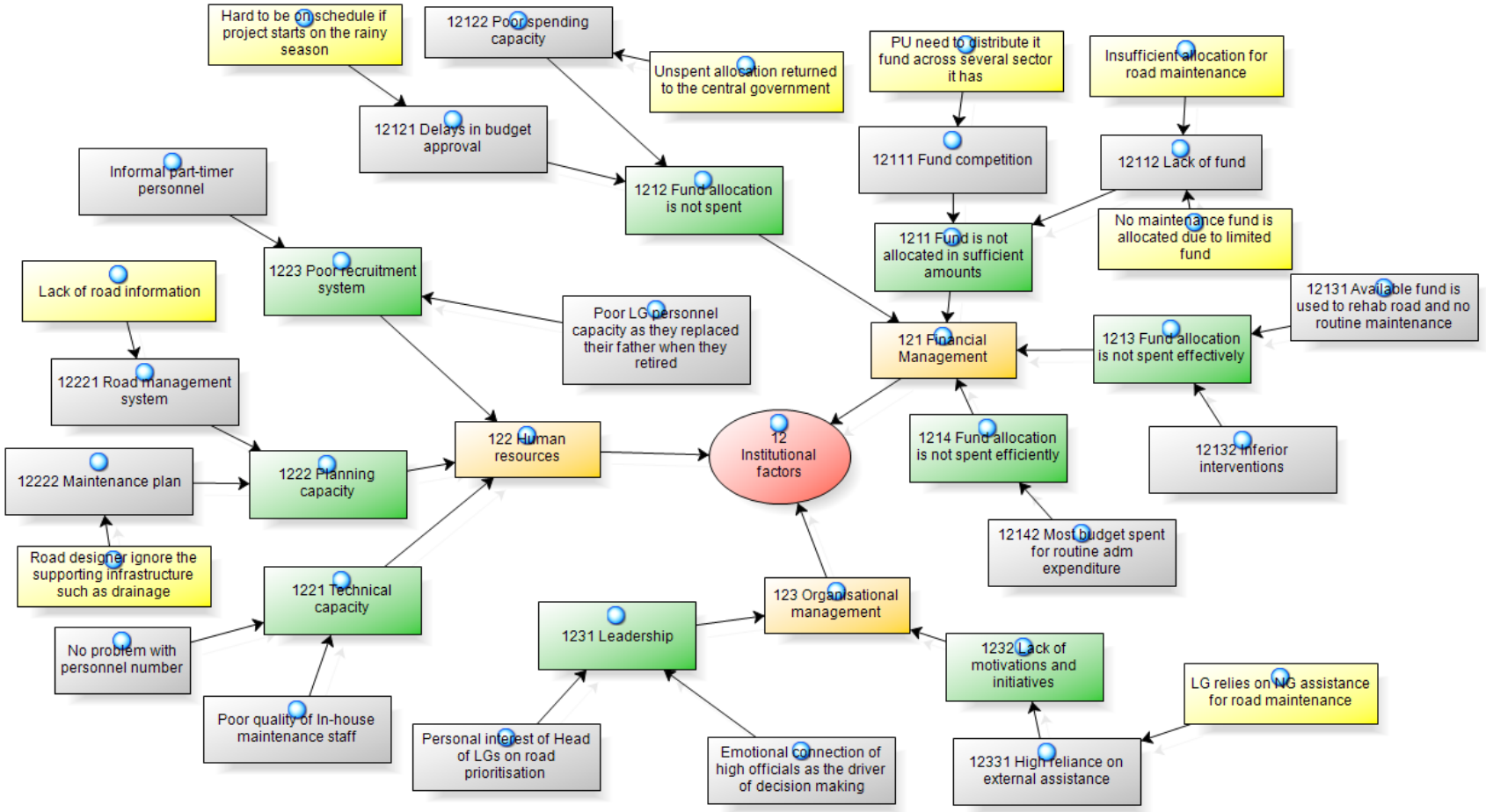


Figure 5.24 – Cognitive maps of the institutional affecting factors of case study one

5.7.1.3 Technical factor

One of the major technical issues emerging from the interviews was regarding the overloading traffic. As explained in section 2.4.2.2, the axle loading capacity plays a significant role in the deterioration of road infrastructure. CS02 was aware of this issue and described

> *"Currently the challenges that we are facing in Aceh Besar… is regarding the overloaded trucks. … They carry materials twice the vehicle's capacity." – CS02*

He further added that even though they were mainly using the national road networks, they would eventually pass through the district roads. Being aware of such condition, CS02 also revealed that it was the responsibility of the transportation agency and the police force to control and monitor the traffic.

The vehicle overloading problem has been widely known to be a subject of argument between the public works and the transportation agency. The institutional arrangement and the distribution of tasks between the two agencies resulted in the continuing disputes between them.

The next technical factor is regarding the supporting plant and equipment. In performing the road maintenance works, the adequacy of the plant and equipment for maintaining roads may largely contribute to the road condition.

In Aceh Besar, CS02 explained that the district mainly used the equipment donated by the IBRD (World Bank) during the 1980s and 1990s. In the post-disaster reconstruction, however, BRR also donated a number of equipment including excavator, tandem roller and shovel loader. CS02 also suggested that they also have the operator personnel for the vehicles. Therefore, the public works of Aceh Besar did not seem to have technical difficulty regarding plant and equipment availability.

However, a similar financial problem was also experienced in the maintenance of the plant and equipment. This was particularly due to the allocation of budget for the operation and maintenance of these vehicles which was argued to be insufficient. As expressed by CS02

"Every year we spare around Rp 100 million (£5000) especially for the maintenance (of equipment) and tools, and also for their operations, which include lubricant oil as well as the hydraulic system." – CS02

He further added that the equipment was also commercialised by renting it to the private companies. This was expected to provide income to the district. However, CS02 rose that Aceh Besar lacked the personnel with sufficient capacity to operate the laboratory equipment. CS02 added

"There were donations from the BRR for laboratory equipment, even though they were not so many that we still had to purchase some more. But… until now they have not been optimised as there are no personnel with adequate expertise to manage it." – CS02

The issue of lack of personnel expertise to operate the laboratory equipment links back to the human resource capacity issue as described in section 5.7.1.2.2. Additionally, CS02 also revealed that due to the lack of lab test equipment personnel, the public works could not use the lab for the projects in the Aceh Besar area. He stressed

"The challenges include the human resource capacity. Actually, the lab equipment can be used for the projects in the district. The district government can actually use the lab to perform tests for the project, whether it is concrete test or asphalt test. But we lack the personnel." – CS02

The human resource capacity issue presented by CS02 raised another concern regarding the capacity building of the Local Government personnel during the post-disaster reconstruction. There seemed to be a gap in the capacity building reconstruction process that led to the procurement of laboratory equipment to agencies which lacked adequate personnel capacity.

Additionally, the capacity of the local government in road maintenance is also affected by the construction quality, as it determines the road axle loading capacity and the deterioration rate. Accordingly, it may also determine the type and the time interval between the maintenance interventions. With regards to the road construction quality, the road surface roughness is widely used as one of the indicators to determine the extent of the road deterioration. For instance, the international roughness index (IRI) is normally used to measure the road surface degradation level. However, road deterioration does not immediately occur in the early years

of completion. Within the grace period, typically the initial four to five years of road construction, road may not show any deterioration at all. According to CS06, this fact could be misleading as people may get too focused on the roughness of the road surface and ignore the actual structures which help achieve or maintain the road roughness over time - the base works. He suggested

> *"What creates the problem is that some defects are due to the base works. The drainage channel, the water outlet, and so on. That is the problem... This may lead to the base failure (collapse)... it normally occurs after two years." CS06*

Furthermore, with regards to the construction quality, most of the road infrastructures start to show deterioration long after the project completion, and commonly after it surpasses the contractors' defect liability period. Accordingly, by the time the roads were starting to show obvious deterioration, the contractors were no longer responsible for the maintenance. The contractors could no longer be held responsible for the damages, particularly on the basis that the road construction was accused to have a poor quality. This section provides an insight into the maintenance capacity of Aceh Besar government. The cognitive map of the affecting factors is presented in Figure 5.25

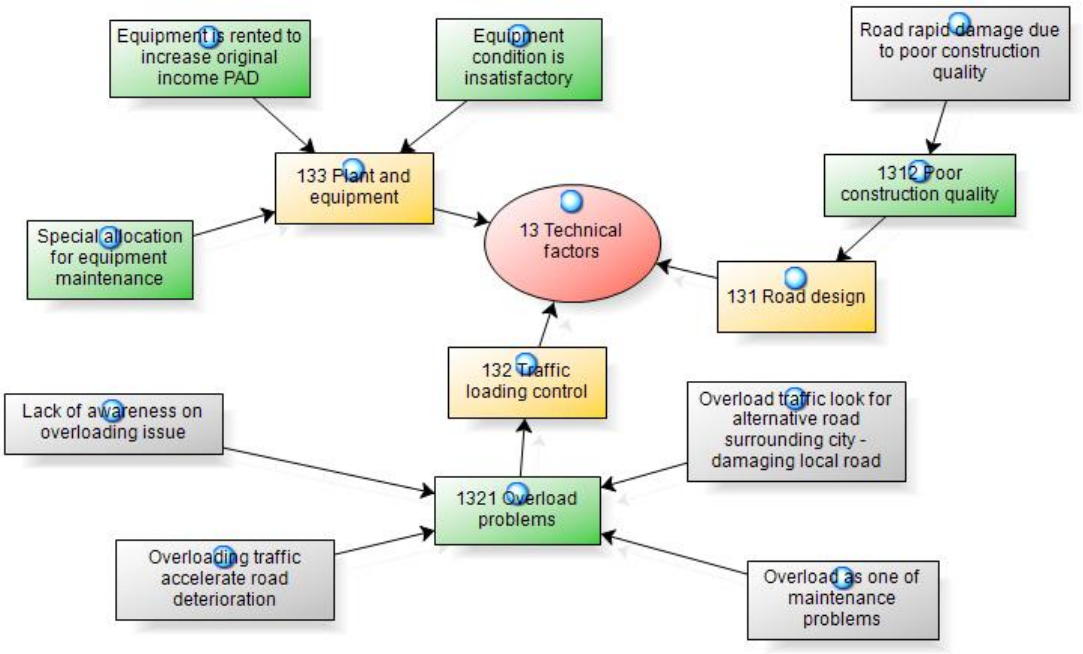


Figure 5.25 – Cognitive maps of the technical affecting factors of case study one

As the technical factors affecting the capacity of the local governments in road maintenance have been discussed, the discussion on maintenance capacity affecting factors has been concluded. Accordingly, the following section will discuss the maintenance strategy adopted in response to the road maintenance needs.

5.7.2 Maintenance Strategy

The maintenance strategy refers to the responses and actions of the local governments to the road maintenance needs. Therefore, this section will elaborate the different issues in the maintenance strategy, covering the responses of the Local Governments to the maintenance needs, funding, and staffing strategy.

5.7.2.1 Prioritisation

It has been explicitly summarised in the previous sections (for instance, in section 5.7.1.1.2 and section 5.7.1.2.1) that the budget allocation for road maintenance generally gets lower priority in Aceh Besar and that the implementation of road maintenance works depended on the approved budget allocation. Additionally, as explained by CS01, the public works would then need to make adjustment in their programs in accordance with the approved budget allocation. CS02 also confirmed that the scope of maintenance works and intervention depended on the approved budget allocation. Furthermore, CS02 suggested that the public works had previously focused its routine maintenance activities on clearing the right of ways and at the same time indicated that such intervention was fruitless. CS02 highlighted

> *"With regards to routine maintenance, we used to focus on clearing the right of way areas. But now in 3 or 4 months, at most 6 months after we cleared them it has fully grown again. Because of the damp and frequent." – CS02*

The CS02's comment above also implicitly suggested a disappointment and frustration of the public works on the rapid grow of the grass and bushes along the roads as the maintenance benefit and consequently the budget allocation would fade away very soon. This was one of the justifications that the public works opted to abandon the routine maintenance needs in their area. More discussion on the response to the maintenance needs will be presented in the following section.

5.7.2.2 Response to the maintenance needs

5.7.2.2.1 Neglect

With regards to the response of the Aceh Besar government to the road maintenance needs, maintenance neglect and responsive approach seem to dominate the road maintenance 'strategy'. CS03 suggested that due to the limited fund availability, road sections did not get regular maintenance. Even though he was aware that the road infrastructure requires maintenance immediately upon completion, the maintenance intervention provided was in the form of road repair when the road had been damaged. As explained by CS03

> *"Actually, a road section, once they are completed, they would be in the maintenance period in the following year. There has been an effort towards it, but the fund is not enough. So regretfully we need to leave it aside, we do other sections first." – CS03*

Whilst CS03 showed his awareness on the immediate needs of regular maintenance, CS02 did not share this view. Instead, CS02 suggested that the road infrastructure did not need maintenance for the next 5 years upon the completion. CS02 advised

> *"As we discussed earlier, maybe for the next 5 years we do not need to maintain because the road construction is still good." – CS02*

CS02 further reemphasised his view on the issue of road maintenance by saying that the maintenance was therefore not a big problem in Aceh Besar. He said.

> *"I think there is no problem regarding maintenance. It is not a very serious problem. Because if the construction was good, for the next 5 years we don't need (to maintain)." – CS02*

The contradictory view of the CS02 which relied on the initial construction quality instead of providing the routine maintenance immediately upon construction completion illustrated that there was a gap of knowledge and understanding on the importance of routine maintenance among the government officials. Such an understanding was particularly required since CS02 had also suggested that their efforts on repairing roads had not been optimal due to the limited fund availability, which eventually forced them to provide routine maintenance on roads requiring periodic maintenance or rehabilitation.

Additionally, both CS03 and CS02 revealed that the road networks in Aceh Besar were simply neglected from maintenance. The adopted approach was to perform surface overlay - which actually falls into rehabilitation intervention, and therefore omitting the routine and periodic maintenance needs (please refer to section 2.4.3 regarding maintenance intervention).

CS02 further added that the district government was currently focusing on improving and upgrading the existing district roads in their area to the Hot Mix Asphalt (HMA) type. As he said

> *"So now we are still upgrading roads. What was macadam we upgrade them to Hotmix (HMA)." – CS02*

Even though upgrading the road surface may improve the road serviceability and durability, the necessity of performing the surface upgrade was questionable, particularly since the district was suffering from financial issues, and that the necessity of the upgrade did not seem to be supported by the economic nor technical consideration.

5.7.2.2.2 Reduced quality

As mentioned earlier, in addition to the responsive approach, maintenance neglect seems to dominate the maintenance 'strategy' in Aceh Besar. However, in addition to the maintenance neglect, another important issue emerging from the interviews was that the limited fund availability also resulted in the reduced road construction standard and specifications. CS02 described this by saying

> *"Especially for the road shoulder… we do selective embankment. Not B class. The standard requirement is B class, but the budget is limited… so depends on the available fund." – CS02*

Technically, CS02's comment on the B class embankment materials was that the construction of road shoulder in Aceh Besar would need to use soil with a CBR of more than 10%, and plasticity index of less than 6% instead of the B class crushed stone as required by the national standard. Consequently, the road construction quality would be inferior.

5.7.2.3 Staffing

The discussion of the maintenance strategy also includes the method of executing the maintenance works. In Aceh Besar, the road maintenance works were carried out by using a force-account method, i.e. using the in-house personnel. The approach was stipulated by CS02

> *"We are expected, regarding the routine maintenance, that we do not use hired equipment. We use our own equipment." CS02*

The discussion on the response towards road maintenance needs in Aceh Besar district have been presented in the above section. The cognitive map of the maintenance strategy analysis is presented in Figure 5.26. Accordingly, the following section will cover the capacity building issue.

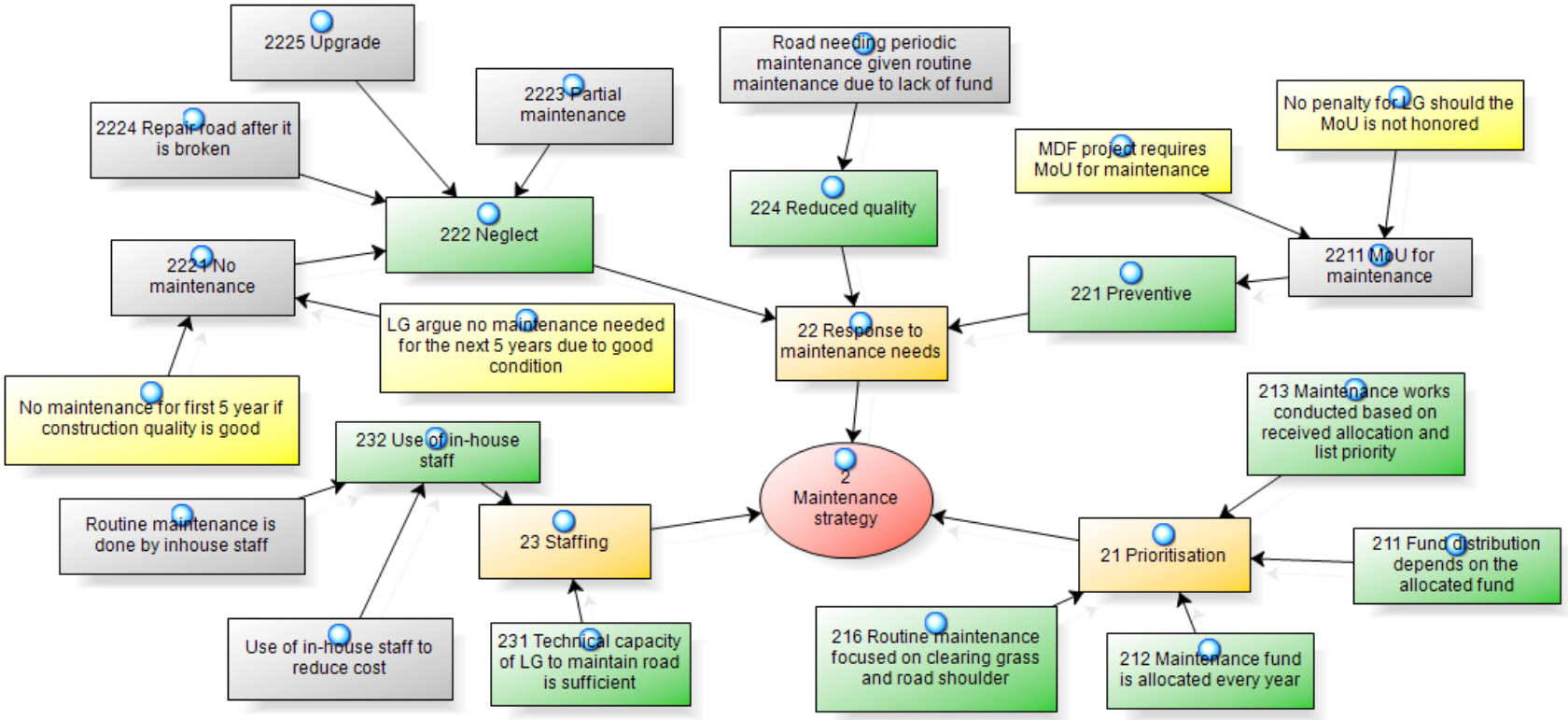


Figure 5.26 – The cognitive map of the maintenance strategy analysis of case study one

5.7.3 Capacity building in road maintenance

5.7.3.1 Capacity building approaches

This section described the various approaches and methods in implementing the capacity building programs related to the road maintenance, as construed by the interviewees. The capacity building programs in Aceh Besar were conducted in various approaches. As highlighted by CS02, there was collaboration between the public works of Aceh Besar and the International Labour Organisation (ILO) regarding the road construction. Additionally, as emphasised by CS02, since the ILO was an organisation focused on the labour, the trainings provided by ILO were more focused on the manual labour aspect of the road construction. He stated

> *"There was. We did have collaboration with the ILO. We also received training on road setting, and so on. And then there was a demonstration of the construction (method). Because it was a labour organisation, the training was more towards manual works such as macadam." – CS02*

A supporting statement was also provided by CS01 regarding the impact and the benefit of the various capacity building programs provided in the post-disaster reconstruction period. CS01 particularly suggested that the support from the foreign organisations during the post-disaster reconstruction have helped the local Bappeda improve its planning skills. He said

> *"The support and roles of the Bappeda (in road maintenance) were not in the form of physical works. But I personally think that the great supports from the foreign institutions (donors)… also helped improve the planning skills. We feel the benefit." – CS01*

Another capacity building approach adopted in the post-disaster reconstruction in Aceh, particularly in the road sector was in the form of knowledge sharing through partnerships and joint programs. Whilst they were not necessarily titled and clearly named as a capacity building program, the impacts and benefits from the knowledge sharing were acknowledged and were expected to sustain in the local institutions.

Additionally, the contractors' perspective on the benefit of being involved in the reconstruction seemed to be varied. CS06 suggested that the reconstruction activities provided a lot of opportunities to gain new knowledge. As he said

"A lot. From the technical aspect, we learned a lot." – CS06

He further explained that the reconstruction process in Aceh indeed increased the capacity of the local contractors and was 'very helpful'. Contrasting the previous opinion, however, CS05 did not seem to have benefited from the reconstruction process. He expressed this as

"It depends. One may say there is knowledge increase. Some may say it was just okay (not really). Some will see no influence at all. To me personally, it is almost the same (no change)." – CS05

Even though he personally did not feel to have had any improved knowledge as a result of being involved in the reconstruction process, he stipulated that the reconstruction process had provided a positive impact to the company's profit.

5.7.3.2 Capacity building challenges

On the one hand, the capacity building program provided for the Local Government personnel was generally limited, which was mostly due to the lack of political interest and the resulting poor budget allocation for the capacity building activities.

On the other hand, there was also an issue with regards to the quality of the capacity building programs provided for the Local Government's personnel. As suggested by CS04, the challenge in the capacity building of the local governments' personnel, particularly with regards to the road maintenance capacity was due to the high focus on the physical infrastructure. Consequently, he added that no capacity building programs were provided to the local governments particularly aimed at improving the road maintenance skills. He revealed

"Capacity building program regarding road maintenance, I think there was none… We never trained people (for road maintenance)." – CS04

Additionally, even though the issue of political interference as a challenge in the capacity building efforts did not emerge in the interviews with the Aceh Besar representatives, it appeared that the capacity building programs did not seem to be conducted in an effective approach. CS02 gave an example that the workshop on road design provided to the public works personnel was not effective due to the very short period. Giving an example, he argued that road design skills could not be achieved from a short three-day course. He suggested

"For the workshop of road design, it was not effective because it was only a three-day short course. It was supposed to be maybe around 2 months specifically for road design, or bridge design. That way it would have better results. If the training is only for 1 or 2 days, the result may not be optimal." – CS02

He further expressed that consequently, most of the personnel with the non-technical background learned and increased their knowledge informally from their colleagues.

CS02 also suggested that the poor capacity of the public works personnel in Aceh Besar was also affected by the inappropriate personnel background. He stipulated that on the one hand, there was an insufficient number of personnel with engineering background which resulted in the technical positions in certain departments had to be filled by the non-engineering personnel. On the other hand, however, there was also a concern that the engineering personnel was assigned to the non-engineering positions

"In some meetings, such as the last one… with the parliament, the infrastructure commission, we have frequently said that there are a lot of personnel with engineering background placed in the non-engineering institutions, which is not related to public works… It can be identified. They should be returned to their habitat (relevant institutions)." – CS02

He further added that due to the inappropriate educational background of the personnel in the public works, the trainings and workshops provided to these personnel did not yield the expected outcomes.

The capacity building in road maintenance in case study one has been discussed in this section. Accordingly, the cognitive map of the capacity building analysis is presented in Figure 5.27. The issue of post-disaster road reconstruction success indicators as they perceived by the respondents in case study one will be discussed in the following section.

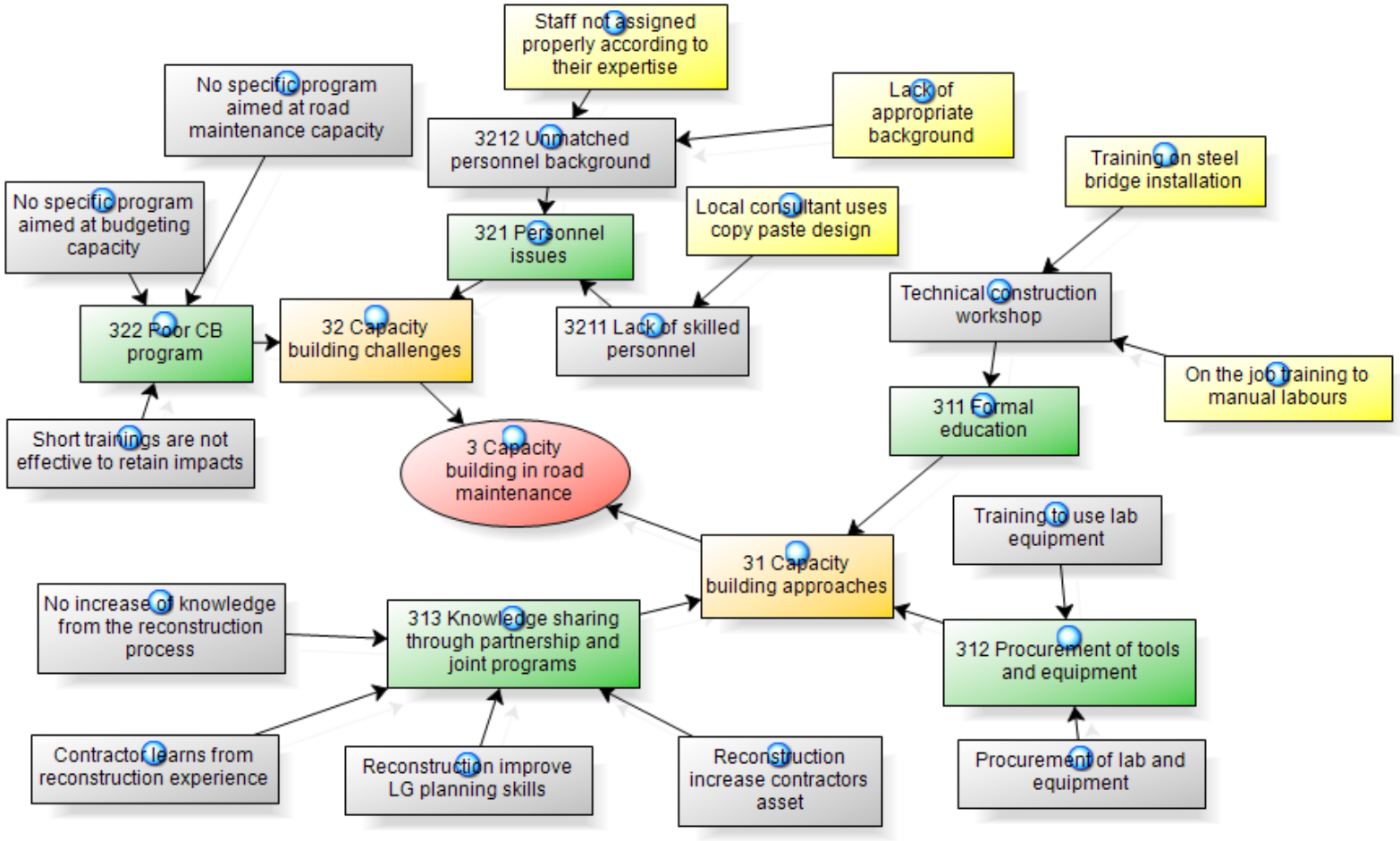


Figure 5.27 – Cognitive map of the capacity building in case study one

5.7.4 Post-disaster road reconstruction success indicator

As previously indicated, this section will present the analysis of the post-disaster road reconstruction success indicators as they are perceived by the respondents of the case study.

The post-disaster reconstruction of road infrastructure in Aceh introduced a 'new' pavement type to the local governments, which was widely used in the reconstruction as it was supposed to have better quality than the initial road construction type, the hot mix asphalt pavement (HMA). CS05 stipulated

> *"Almost everywhere in Aceh, almost 100% are hot mix. Even the village (roads) are all hot mix. No more gravel road. If any, small alley would use paving block or concrete road. Generally roads in Aceh are now good. – CS05*

From the interviews with the stakeholders in Aceh Besar, it emerged that the reconstruction of road infrastructure in Aceh Besar had provided positive impacts to the socioeconomic condition of the community. As expressed by CS01, the improved access in Aceh Besar has resulted in the development of a number of housing settlements in Jantho, the capital of Aceh Besar.

> *"The economic condition has certainly improved… Jantho is now crowded, one of the reasons is the development of the housing settlements." – CS01*

Not only have the road reconstruction processes resulted in the improved infrastructure and the socioeconomic condition, CS01 also suggested that the reconstruction activity had helped the local government personnel improve their capacity. He argued that the experience and knowledge obtained from being involved in the reconstruction process helped them prepare a better planning. He said

> *"It can be seen in the (preparation of) planning document of every project. Before (tsunami), we undermine the importance of planning. I mean, we submit the request, and build. No planning. In the reconstruction, we were taught. We were trained to prepare planning document. The DED, master plan, budget and planning. It was, for me, the most important lesson." – CS01*

He further said

"We're not used to do that (planning). We used to do all in one year. It may work, but there was no good planning." – CS01

The above discussion concludes the discussion of the post-disaster road reconstruction success indicators. Accordingly, the cognitive map of the success indicator analysis is presented in Figure 5.28

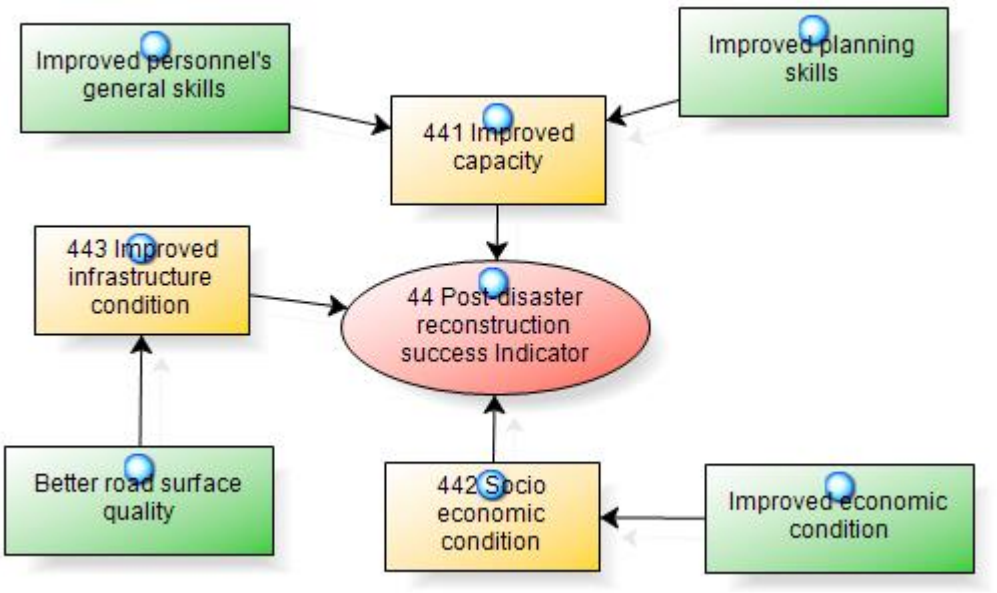


Figure 5.28 – Cognitive map of the post-disaster success indicators

The above sections have provided an in-depth discussion of the analysis of the first case study. Accordingly, the following section will provide a discussion on the second case study of the research, Aceh Jaya.

5.8 Analysis of case study 2 – Aceh Jaya

5.8.1 The maintenance capacity affecting factors

5.8.1.1 External factors

The external factors for the road maintenance are those which are beyond the direct control of the road authorities. Accordingly, these external factors will be elaborated in the following sections.

5.8.1.1.1 Environmental

In performing their road maintenance tasks, road authorities are often faced with the environmental challenges. The environmental condition, such as weather and terrain condition, negatively affects the deterioration rate of the road infrastructure. Cracks on the surface of the pavement may allow water ingress into the pavement surface. This may eventually disintegrate the road structure and therefore requires immediate repair intervention.

The environmental factor emerging from the semi-structured interviews was regarding the frequent flooding events. As highlighted by CS11, the frequent flooding events in the districts largely contributed to the rapid deterioration of the road infrastructure. He said

> *"Occasionally the nature also (contributes to the rapid road deterioration). Occasionally, there are floods. The Teunom area (a sub district in Aceh Jaya) is often flooded. Asphalt will break apart (the road structure) when water touches it. When it comes to water, asphalt is not very strong." CS11*

Since some areas have different exposure to natural hazards, the areas with higher risk of natural hazards will accordingly need even higher attention with regard to the road maintenance. From the interviews with the respondents in the case study, flooding has been considered as the main environmental concern to the road maintenance. The following section will accordingly provide an insight into political factors which affect the Local Governments' road maintenance capacity.

5.8.1.1.2 Political

In Aceh Jaya, the local political condition also affected the road maintenance capacity of the local government. As described by CS13, in order to meet their political agenda, the parliament members would therefore intervene the projects and programs proposed by the Local Governments. Additionally, CS09 also revealed that the political pressure in determining the budget use and location of projects was higher after the post-disaster reconstruction had completed. This was particularly due to the reduced number of projects in the area, which

resulted in the higher competition among contractors, as well as politicians, to win the development projects. As CS09 stated

> *"There are conflicts of interests. It was not so high (the political pressure) during the reconstruction because there were many (work) packages. If they could not get from the public works, they might get it from the BRR. Now, they can only get it from the public works." – CS09*

CS09's statement above suggests that currently the road infrastructure maintenance was experiencing a higher political pressure from the parliament as the post-disaster reconstruction activity in the area had been virtually ended and the number of projects had decreased.

5.8.1.1.3 Socio-economic factors

The west coast area of Aceh province where Aceh Besar, Aceh Jaya, and Aceh Barat Daya are located is mainly occupied by the palm trees agriculture and the mining industry. As a result, trucks and other vehicles transporting the heavy load consequently need to transport the harvest to the processing plant or ports through the district roads, before they get to the provincial or the national road. This activity consequently and greatly contributes to the rapid deterioration of the road infrastructure that they pass through, particularly when the road sections are not structurally designed to cope with the heavy loads. As explained by CS12

> *"The roads which are designed for normal traffic are later on used for trucks transporting palm trees. The damaging factor is different, right? ... This means that on the one hand the government is faced with the dilemma that if it (traffic loading control) is enforced, they (business investment) may not come to the area. If they are allowed, the infrastructure will be damaged." – CS12*

The CS12's comment also reveals that the Local Governments were facing a dilemmatic position. On the one hand, the agricultural and mining industry is necessary to help improve the economic condition of the areas. On the other side, however, allowing the heavy loaded vehicles to pass through the district roads will damage the infrastructure. He also added that in reality the Local Governments tend to ignore this problem and is more focused on the direct income that the industry may provide to the district. To solve this issue, CS12 later emphasised that the local governments should be in charge and lead the process of enforcing the maximum

axle loading capacity regulation. This is particularly due to the involvement of several institutions in the road management.

Furthermore, one of the justifications for the local governments to focus on the road construction rather than the maintenance was that because the district area was too wide that there were high needs and pressures to provide wider access to the community. This was also experienced in Aceh Jaya. Moreover, in Aceh Jaya, this condition was worsened by the fact that some areas in the districts were still isolated. As justified by CS10, referring to the isolated community in the district

> *"We can say that they do not have their independence yet… They need to walk as far as 5km before they could find the access road. So how can we (spend money to) maintain, whilst here (in the isolated area) it is very contrasting, they do not even have roads." – CS10*

Accordingly, a similar view was also expressed by CS10. Combining the views on wealth distribution and setting up the development priority issues, he concluded that expanding the road networks should get a higher priority than the maintenance of the existing networks. He said

> *"I am more towards the first option (expanding networks)… Why? Analogically, we need to eat first, and then we need to shower. It can't be that we need to shower, if there is nothing to eat. So we need to construct first. If there is no construction, what to maintain?" – CS10*

CS10 added that the local governments did not focus on ensuring the comfort of the road users by providing the proper maintenance, but rather limited their focus to a level where road safety can be achieved. CS10 stated

> *"We focus on the construction first, even though the maintenance is not so good, even though it is not comfortable… But in the LG, we do not seek comfort, we only seek for safety." – CS10*

Furthermore, preferring to focus on the road expansion, CS10 based his argument that spending money for the road expansion would give more benefit to the community than the road maintenance would. He said

"If we maintain this road, a road section of 20km (for example)… 10km of the road is currently not passable. So, rather than maintaining the (passable) 10km, we better use the money to extend the passable length." – CS10

In supporting the CS10's view, CS08 highlighted that the resulting impact of the high preference on the capital project was that the budget allocation for road maintenance was insignificant and insufficient

"So the maintenance (fund) of the road is not significant, not so significant. The districts mostly focus on building new roads." – CS08

In addition to the above discussion, there also seems to be a high social pressure from the community to build and expand the road networks. However, the community was also argued to have lacked the sense of ownership to the road networks that have been built in their neighbourhoods.

In another case, interviewee CS13 described an example from the project he was involved in where the farmers in the rural areas destroyed the drainage channel to water their farm. The local farmers were used to get water for their farms from the irrigation and drainage channels along the road shoulders. When the road was rehabilitated, the drainage channel was upgraded from the soil embankment to the concrete ones. Apparently, the new drainage construction did not provide water inlets to the farming areas and some spots were therefore smashed for the water inlets by the local farmers.

In the particular case that the CS13 brought up, it seems that there had been lack of communication and stakeholders' involvement in the construction process. Apparently the farmers' dependence on the drainage channel was not accounted for, or alternative sources of water were not introduced to the farmer in the road drainage channel rehabilitation design. This flaw eventually led to farmer forcefully broke the drainage wall as the solution for their farming needs.

Another major issue affecting the performance of the local governments in road maintenance was due to corruption. Particularly addressed to the development of the road information management system, CS12 argued that the idea to develop a proper GIS-based system for the

road maintenance had been proposed and initiated during the post-disaster reconstruction period. He argued that such system would provide the road authorities a strong basis to identify the maintenance needs. In turn, this would also help road authorities to justify their budget proposal, by delivering informed-consent options to the parliament, without having to fight and bribe the parliament. Regardless the benefit of adopting such a system, however, CS12 argued that the development of the GIS-based road information management system would reduce the Local Governments' dependencies on the consultants for the preparation of their annual work plan and at the same time provide well-justified budget proposal. However, he further explained that the proposal for the development and utilisation of the road information management system was rejected by the Local Governments, accusing that it was based on the reduced chances and opportunities for corruption. Additionally, the local consultants seemed to have encouraged the Bupati to reject the system. As he said

> *"By using the system, the local governments do not need to call consultant to do the planning… with minimum resource capacity, it can be notified which road sections need maintenance. If the system runs, it would be very helpful. However, I see that there was a high influence of the local consultants." – CS12*

He further gives another suggestion of the influence of the local consultants by saying

> *"In the bid tender of a project which was initially aimed for district road planning, there were so many consultants brought by the Bupati. Apparently behind the Bupati were them (the local consultant). It can be imagined that such program will be very much hated by them (the local consultant) as it would affect their roles." – CS12*

The above sections have discussed the socioeconomic factors affecting the capacity of the local government of Aceh Jaya in the road maintenance. Accordingly, the following section will discuss the impact of safety and security condition to the capacity of the local government of Aceh Jaya in road maintenance.

5.8.1.1.4 Safety and Security

In addition to the socioeconomic factors, the performance of the public works in road maintenance was also affected by the safety and security issue. During the project implementation, contractors were often faced threats and oppressive behaviours from the

community. Such threats and oppressive behaviours were commonly followed or initiated by their demands to be involved in the project as materials suppliers or the construction workers. However, the community frequently demanded for irrational requests which contractor could not provide.

After the peace agreement in 2005, a committee called KPA (Aceh Transformation Committee) was established. The establishment of the KPA was part of the peace agreement clauses, which aims at the transformation and the reintegration of the ex-combatants to the society. The KPA organisation structure spread all over Aceh and their chapters were also formed at the districts and sub-district level. However, as described by CS10, at the ground level this organisation further expanded and operated as a means to put pressure on the government personnel, particularly on the bid tender and the implementation of the development projects. CS10 added that the implementations of the road projects were occasionally disrupted by the individuals from the KPA, who forcefully demanded to be involved in the project. As CS13 explained, in many occasions, the lack of capacity of the local community to be involved as construction workers, as well as the higher price of materials offered by them, put contractors in a difficult position to approve their request and to accept the offer. CS13 further explained

> *"Looking at the quality and the cost (of works provided by the community), the contractor could not give the job to the community groups… The community there asked to do the works by setting up a price which contractor was unable to pay." – CS13*

Threats and oppressive behaviour were not only posed by some community groups towards the contractors working in their area. It was also suggested that there were unhealthy competitions between the contractors in winning a project.

CS10 further explained that the solution to such disruption was to coordinate with the local village apparatus and the local KPA leader. The KPA at the village level was also known as 'Sagoe', literally translated as the corner or branch in Acehnese language. He added that it was not only the government personnel who needed to coordinate with the 'Sagoe'. The contractors would also need to coordinate and disseminate information about the project to the locals. As he said

"Also for the contractors, they would disseminate to the locals that they would have a work package there." – CS10

Additionally, to ensure that the project could be implemented well and without disruption, a personal approach and agreement with the Sagoe leaders was frequently required. As a result, the KPA members would generally be involved in the project as the contractors' personnel or as the suppliers for the project. CS10 implicitly revealed that this practice was well-coordinated and well-organised by the KPA at the higher level. He said

"Since the 'Sagoe' might have been directed by the KPA regarding the project in their village, the contractors would later need to recruit some of the local KPA members in the project. Whether as a night guard... or if they have a business, might also be as the suppliers. So we share (the works)." – CS10

Whilst the above discussion illustrates how the security and safety issue would affect the implementation of a project in the field, the influences and pressures from the KPA also seemed to have a greater impact on the project tender process. CS10 described that he had to coordinate with the KPA and distribute the construction work packages to the KPA members. As CS10 explained

"We always coordinated with them (KPA). We explained (to the leaders) so that they could convey the message to their members that we are all equal. We would distribute (the projects) in the tender process. So there would be no one says that I have to win such and such project, or this must be mine. What happened was that we arranged them through the (formal) procedure, through tender." CS10

It is then obvious that the security and safety threats in Aceh Jaya had significant impacts to the capacity of the local government in the implementation of the development projects. In some cases, such disruption occurred in the form of forceful demands to be involved in the project as construction personnel or suppliers. In some other cases the disruption took place in the form of forceful demands to win the project tender.

The above discussion concludes the analysis of the external factors affecting the capacity of the local governments in road maintenance. Accordingly, the cognitive map of the external affecting factors is presented in Figure 5.29.

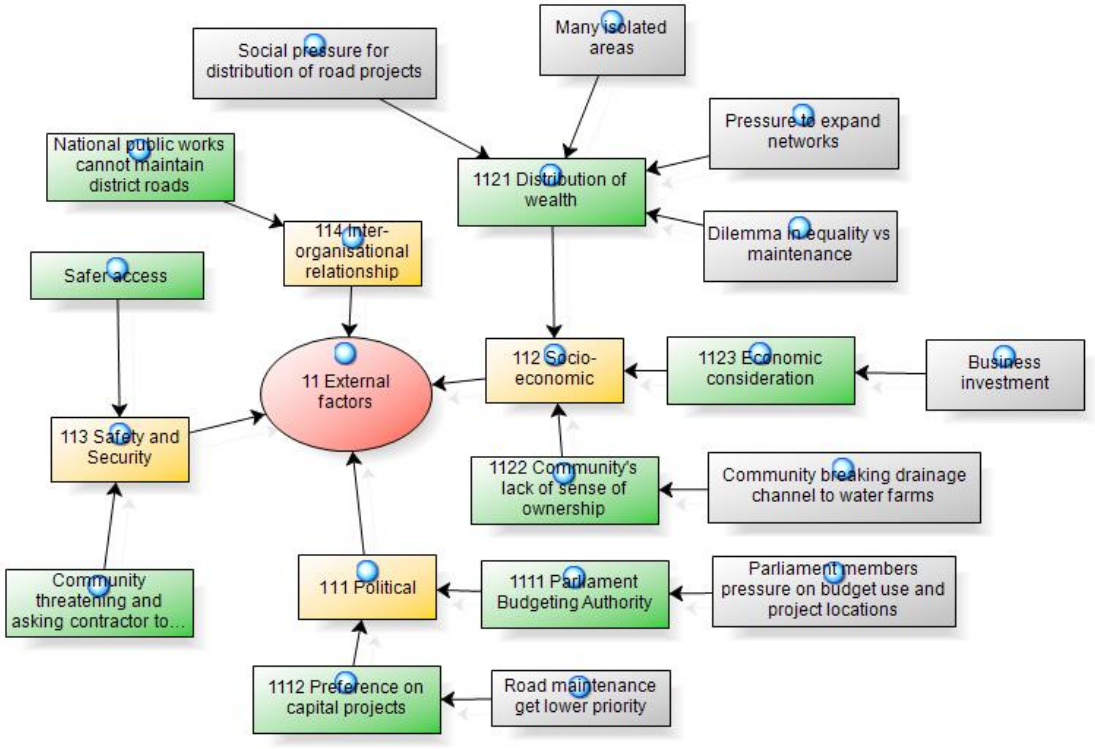


Figure 5.29 – Cognitive map of the external affecting factors of the case study two

As the external factors have been discussed, the following section will present the institutional affecting factors

5.8.1.2 Institutional factors

5.8.1.2.1 Financial management

The financial issues of road maintenance in Aceh Jaya emerging from the interviews can be grouped into three categories. The categories are: fund is not allocated in sufficient amount, fund allocation is not spent, and fund allocation is not spent effectively.

5.8.1.2.1.1 Fund is not allocated in sufficient amount

The financial issue of road maintenance in Aceh Jaya also experienced the extreme example of road maintenance problem. As stipulated by CS10, the road infrastructure was simply neglected of maintenance immediately upon their completion. This was particularly due to the lack of budget allocation for road maintenance. CS10 revealed

"All this time we never allocate budget for maintenance, because our budget is very, very limited." – CS10

One of the main causes of the insufficient budget allocation for the road maintenance was due to the fund competition with other expenditure needs. Accordingly, CS13 revealed that the maintenance needs always lose the competition with the capital projects. The resulting consequence was that the road maintenance did not get optimum allocation. However, CS10 further added there was a small provision of budget allocation for patching potholes on the roads, even though in a very small amount. As he said

"Well, for patching the roads the fund is very limited, not nothing at all." – CS10

A similar suggestion was also implied by CS09. Confirming CS10's comment on the lack of road maintenance budget allocation, CS09 added that the budget for the road maintenance needs had not been allocated regularly in their annual budget proposal. CS09 stressed

"For the maintenance, it is not certain. It seems that there is no maintenance this year, not at all. So it is focused on road upgrade and new construction." – CS09

5.8.1.2.1.2 Fund allocation is not spent

On the one hand, there was an issue with regards to the insufficient allocation for road maintenance, due to various aspects as described in the previous section. On the other hand, however, there was also an issue with regards to the ability of Local Governments to spend their budget allocation. From the interviews, it was revealed that one of the financial problems in Aceh Jaya was the poor capacity of the local government personnel to spend their budget allocation. Even though it was not specifically addressed at the Local Governments' capacity to spend the budget allocation for the road maintenance, the condition was relevant to the road maintenance capacity as the lack of funds was often used to justify the maintenance neglect. The annual budget realisation is shown in Table 5.19.

As shown in the table, the budget expenditure ratio of the Aceh Jaya district had been poor. Whilst in 2007 the budget realisation was as low as 59%, the budget realisation in 2009 was far more than the budget at 116.2%, which means that the district expended more than their budget allocation.

Table 5.19 – Annual Budget Realisation of Aceh Jaya

Year	*TOTAL INCOME*	*TOTAL EXPENSES*	*REALISATION*	*UNSPENT ALLOCATION*
2006	***Rp 145,425,680,000***	***Rp 137,792,440,000***	***94.8%***	***Rp 7,633,240,000***
2007	***Rp 497,696,806,270***	***Rp 293,971,531,305***	***59.1%***	***Rp 203,725,274,965***
2008	***Rp 494,610,005,769***	***Rp 380,475,472,070***	***76.9%***	***Rp 114,134,533,699***
2009	***Rp 317,410,485,560***	***Rp 368,747,488,635***	***116.2%***	***Rp – 51,337,003,075****
2010	***Rp 420,207,756,862***	***Rp 389,319,578,238***	***92.6%***	***Rp 30,888,178,624***
2011	***Rp 457,873,401,687***	***Rp 413,563,457,294***	***90.3%***	***Rp 44,309,944,393***
2012	***Rp 475,805,789,433***	***Rp 408,950,000,000***	***85.9%***	***Rp 66,855,789,433***

Source: DJPK (2014)
****Overspent allocation***
Note: £1 ~ Rp 20,000

With regards to unspent budget allocation, delays in the annual budget approval were accused as one of the reasons. As explained in section 2.5.5.1.3, the spending period of the annual budget will not be extended to compensate the budget approval delays. CS10 explained this condition by saying

> *"The first problem is budget approval. It is usually (approved) on April. Later on, the (detailed) budget use is finalised by May. Then the tender process takes three or two months. So the project implementation begins in July, or august. Then, we know that September or October is rainy season. Consequently, by the end of the year we cannot finish. So, most of the fund is carried over (to the next year)." – CS10*

CS10's explanation above also suggests that the delays in budget approval would lead to projects having to be implemented in the rainy season. Consequently, not only do the delays shortened the project implementation period, they would also force contractor to work in a poor site condition resulting from the rainy season, aggravating the already bad situation.

Another cause of budget allocation not being spent, as revealed by CS10, was due to the poor capacity of the local government institution to create the development projects and complete them as planned. Being a local government personnel loaned to the BRR in the reconstruction process, CS10 compared and contrasted his experience in the BRR to the local government institutions. He illustrated

"For instance, there are 60 personnel (in the LG), but to spend a mere Rp 50 billion has been difficult. In my experience (in BRR), in one unit the personnel were only six people, but we could spend more than Rp 100 billion in a year… because of the capacity. The skills were really exercised. But the 60 personnel (in the LG) cannot even spend the Rp 50 billion. Every year there will be carried-over budget." – CS10

The carried over budget means that the unspent budget allocation for the project can be carried over to the next annual budget. However, to reflect the local governments' actual budget expenditure capacity, the annual budget allocation may accordingly be reduced.

5.8.1.2.1.3 Fund allocation is not spent effectively

Another financial issue in the road maintenance is regarding the ineffective use of budget allocation. This was also experienced in Aceh Jaya, as revealed by CS10. He revealed that in Aceh Jaya, the new road expansion projects were occasionally disguised as road maintenance projects. This was done particularly due to the high interest on the capital projects and in providing wider access to the community. Disguising a capital road project as a maintenance work was also done in order to receive the financial assistance from the national government. The financial assistance would only be given under the condition that the fund would be used for the road maintenance. Regarding this issue, CS10 shared that

"In some occasion, we construct new roads, but the (project) title is maintenance. This was done so that financial aid from the central government can be obtained. So we got the maintenance fund, but we could not use it (for maintenance). We had to use it for the road construction." – CS10

Since the financial assistance for the road maintenance was disguised to fund the road expansion projects, the use of the funds would then be ineffective to solve the road maintenance problems in Aceh Jaya. Until this issue was solved, it is argued that pouring-in more financial assistance for the maintenance of the road district in Aceh Jaya would not likely improve the road infrastructure condition.

5.8.1.2.2 Human resources

This section discussed the human resource capacity for the road maintenance in Aceh Jaya district. According to CS09, the technical capacity of the public works personnel was sufficient

and therefore was not a concern for the road maintenance. However, a different view was suggested by CS10. He suggested that the human resource capacity of the road maintenance personnel was very limited. Both in quantity; the number of personnel, and the quality; the individual skill. CS09 said

> *"The available personnel were really limited. Whether in terms of quality or in terms of quantity, both are very, very limited." – CS10*

CS13 added that the maintenance of the post-disaster reconstruction assets would have to deal with the poor engineering knowledge of the local government personnel. Similarly, CS12 also suggested the poor technical knowledge of the local government might hinder the road maintenance efforts, rather than the financial capacity. He argued

> *"We realise that there will be special autonomy fund, which is very big. But indeed the capacity is so limited in terms of technical knowledge." – CS12*

CS10 further added that there were no trainings or workshops provided by the agency for the personnel in order to improve their skills. He said

> *"As far as I know, institutionally, there has not been such trainings, or sending the personnel to the educational institution."- CS10*

According to CS10, the lack of training programs for the road maintenance personnel was due to the poor awareness and interest of the parliament towards such soft projects. Accordingly, the budget proposal for training was rarely approved. He further explained that the parliament was more concern on activities which could give direct and immediate result. Regarding the provision of training programs for the personnel, CS10 said

> *"In addition to the budget (limitation), there is also an issue of awareness. The awareness of our parliament is rather poor towards such soft projects. Why would we spend money if it is only for training? The results are not immediately visible. For instance, if we spend the budget allocation of Rp 500 million, if it used for constructing road we would get 500 meters. The results are immediately visible.*

Whilst the local government personnel were argued to have limited capacity, interviewee CS13 proposed a contrasting view. According to CS13, the technical capacity of the Local

Governments' personnel to perform road maintenance tasks was not a main concern. He based his argument on the relatively standardised technology of the road construction. CS13 suggested argued

> *"For road infrastructure, it is not the case (technical capacity problem), it is normal. Because the technology is the same. So in the road sector, from the human resource aspect there is no problem." – CS13*

According to the above discussion, the political influence and pressure from the parliament seemed to be a major challenge to the human resource development in Aceh Jaya. Furthermore, with regards to the maintenance work plan, the lack of proper road information system also affected the road maintenance work plan in Aceh Jaya. According to CS09, the road agency produced their road maintenance estimate based on the road's surface area. He explained

> *"We estimate road maintenance needs as a percentage of the roads' square meter area (surface area)." – CS09*

Accordingly, it appeared that the road authority in Aceh Jaya district lacked the appropriate justifications to produce the road maintenance need estimates.

5.8.1.2.3 Organisational management

From the organisational management perspective, leadership was also seen as an issue in the road maintenance in Aceh Jaya. The first issue emerging from the interviews was regarding the conflict of interest in determining the development of road maintenance program. As suggested by CS13, the local governments did not give adequate attention to the road maintenance problems, particularly the roads that were far from the government centre. He argued

> *"The Local Governments do not optimally allocate maintenance fund for their district, unless the roads are located in the centre of government activities. Why? For them, what is important is that the road to the government centre is good. Meanwhile, what we think most important is the economic access, access to the centre of economic activities" – CS13*

He further argued that the local governments commonly make decisions based on the individuals' personal desire and motivation instead of based on the needs and priority.

The following concern emerging from the interview regarding the leadership in Aceh Jaya was the high dependence of the leaders on the financial assistance from the external source. The local governments were also suggested to have lack of motivations and initiatives to perform and improve their infrastructure condition using their own resources. This view was suggested by CS12. He argued that instead of showing efforts and initiating the improvement process, the local governments tend to ask for assistance from the very beginning of the process. As also revealed by CS09, the substantial scale of the road infrastructure reconstruction in the district was seen as a burden to the local government as they were obliged to provide the future maintenance needs. There was a high expectation from the Local Governments that the BRR would build all their road infrastructure needs. As expressed by CS09

> *"If BRR built, for instance, in Aceh Jaya there are 230 km of roads, If BRR built all of them then we would only need to maintain them. No longer need to build the roads, just to maintain." – CS09*

He further added that having to maintain the road infrastructure at the same time when they also have to expand their road networks was overwhelming.

> *"We are overwhelmed. Whilst we build all of the roads, whilst we build what was left by the BRR, we also do maintenance. This is a polemic." – CS09*

Accordingly, not only did this condition reflect the high reliance of the Local Governments toward the external aid, but also illustrated the poor understanding of the road authorities on the continuous need of the road maintenance.

The above section have provided the analysis of the institutional affecting factors of the case study. The cognitive map of the analysis is presented in Figure 5.30. The next section will accordingly present the analysis of the technical factors.

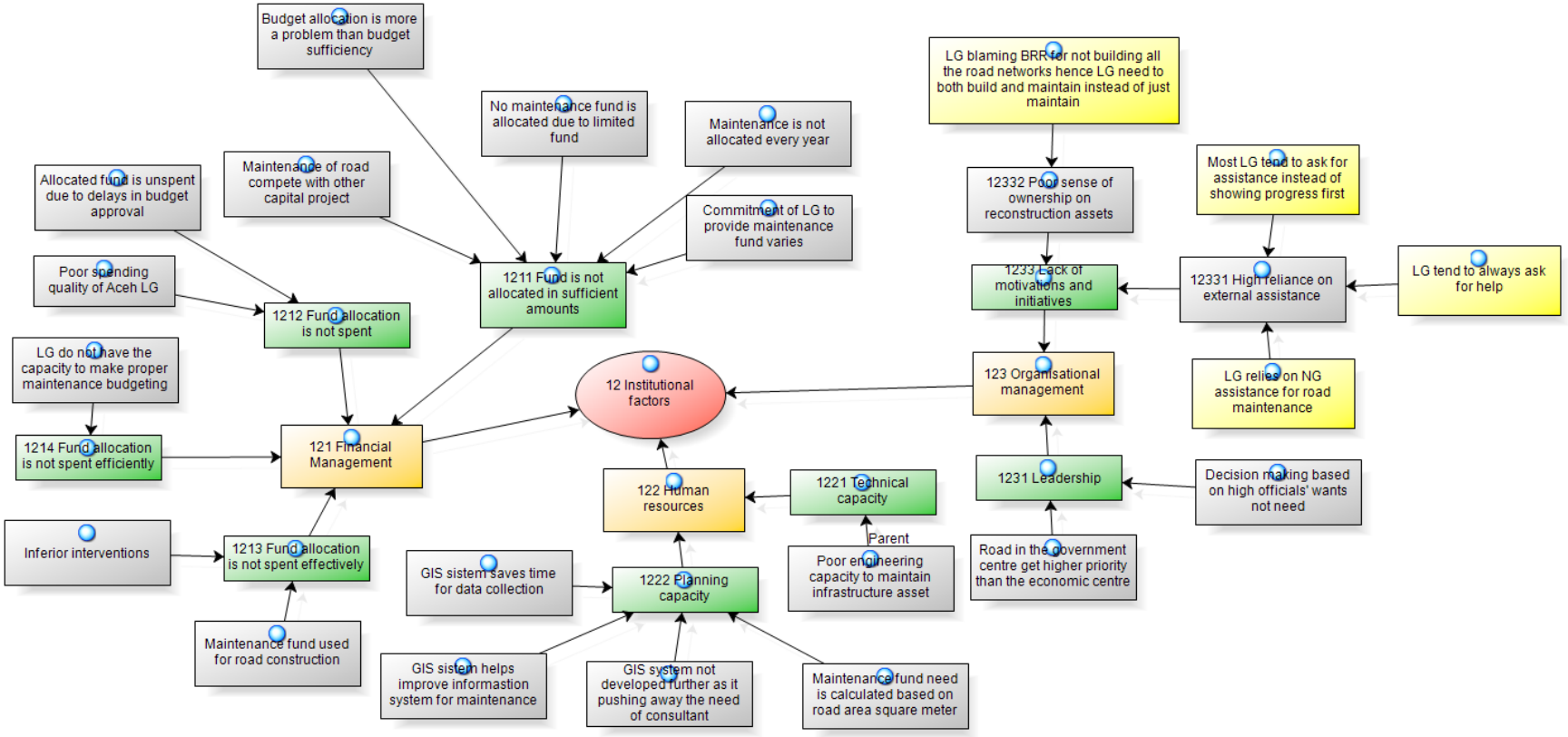


Figure 5.30 – Cognitive map of the institutional affecting factors of the case study two

5.8.1.3 Technical factor

From the technical perspective, the local governments' maintenance capacity appeared to be affected by the over-standard design of the road infrastructure built in the post-disaster reconstruction period. The over-standard design generally refers to the 'new' type of road construction relative to the local governments' general experience. One of the consequences of the introduction of the standard design was that the construction and the maintenance cost were accordingly higher. This concern was confirmed by CS13 as he said

> *"Since the district financial capacity is poor, many of the projects we built do not get sufficient maintenance. Why? What we did was high design, high quality (infrastructure). Therefore… district financial capacity is insufficient to provide the optimum maintenance. Because what we built was of high quality." – CS13*

Furthermore, in the execution and implementation of road maintenance projects, the supporting plant and equipment also plays an important role in determining the road maintenance success. In the district of Aceh Jaya, CS10 suggested that the available equipment was insufficient. He said

> *"Both the human resource capacity and the equipment were very limited. So far we only have two motorised grader and 2 compactors. Those are the only equipment we have." – CS10*

According to his further explanation, the poor equipment condition had been reported and, in fact, a request to buy more equipment had been regularly submitted with no success. CS10 revealed

> *"We have submitted a request. We did submit a request to buy equipment. Until last year, we did not get allocation for more equipment to support the maintenance of roads and bridges." – CS10*

Furthermore, with regards to the construction quality, most of the road infrastructures start to show deterioration long after the project completion, and commonly after it surpasses the contractors' defect liability period. Accordingly, by the time the roads were starting to show obvious deterioration, the contractors were no longer responsible for the maintenance. The

contractors could no longer be held responsible for the damages, particularly on the basis that the road construction was accused to have a poor quality.

The issue of holding contractors' liability gets more complicated since the poor quality issue is also then mixed with the issue of traffic loading control. The road deterioration problems are commonly linked with the issue of poor construction quality and the overloading traffic. The issue of the overloading traffic on the west coast of Aceh was raised by CS12 in the interview. He suggested that in addition to the poor technical and financial capacity to perform the road maintenance tasks, another important factor is with regard to the traffic loading control capacity. As CS12 highlighted

> *"After that (the defect liability period), it is no longer the responsibility of the contractor. And we can do nothing about it. Roads that were designed to serve normal traffic, then used by trucks transporting palm trees. The damage will be different, right?" – CS12*

CS12's view above described the common experience in the road project in the case study districts.

The above discussion concludes the road maintenance capacity affecting factors from the technical perspective. The cognitive map of the technical affecting factors is presented in Figure 5.31.

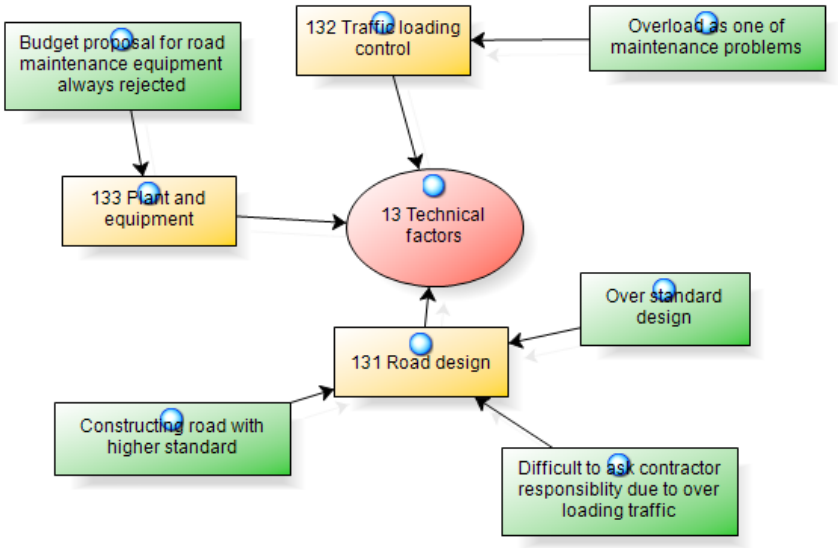


Figure 5.31 – The cognitive map of the technical affecting factors of the case study two

As the analysis of the road maintenance capacity affecting factors have been elaborated in the above sections, the following section will accordingly present the analysis of the maintenance strategy of the case study two.

5.8.2 Maintenance Strategy

This section will elaborate the strategy adopted by the district of Aceh Jaya in the maintenance of its road infrastructure. Similarly, the maintenance strategy refers to the responses and actions of the local governments to the road maintenance needs. Therefore, such responses and actions include the responses of the Local Governments to the maintenance needs, funding, and staffing strategy.

5.8.2.1 Prioritisation

The discussion on the method of dispersing budget allocation was presented by CS09. He suggested that the government of Aceh Jaya used to spend its road maintenance and construction allocation to ensure that a certain part of a road section would have a complete construction and smooth surface. He further explained that in that approach a long road section would be chunked into shorter sections and that the available budget would be spent on whatever length it might be sufficient to pave the surface. However, he advised that the strategy would be changed. The available budget allocation would be used to repair or construct new road and spread equally to the whole targeted road sections. Even though this could mean that the budget allocation would be insufficient for the targeted road section to get the surface paved. As he said

> *"In the future, what we will do, we will make a target first… If there are 50 km of road sections, what we did was (to fully complete the road in) 10km, 10km, 10km… In the future we will do it as per work item. For the foundation, we will do the foundation for 50km. Next year if we make the base, 50 km of the base must be completed." – CS09*

CS09's explanation above was believed to give more effective outcomes in terms of road infrastructure development. The argumentation was that such approach would help achieve the objective of providing the widest access to the community by opening and providing decent access to the previously inaccessible areas. The justification of such approach seemed to be logical, particularly if one would see the immediate result of improved and better access.

However, such approach might potentially lead to higher interest on the capital road project to upgrade and complete the unfinished construction, higher pressure from the community as the road infrastructure may appear to be incomplete, and at the same time does little or nothing to keep the constructed road maintained.

5.8.2.2 Response to maintenance needs

5.8.2.2.1 Neglect

The response of the local government of Aceh Jaya to the road maintenance needs was similar to Aceh Besar. The local government did not see that road infrastructure would need to be maintained regularly and immediately after the construction. Even more, as described by CS08, the response to the road maintenance needs was rather responsive, which was to wait until the roads started to break, and that a regular maintenance would be unnecessary. CS08 described

> *"Most of the roads in the sub-districts, the district roads, are new roads… Maybe, there is no action yet (for maintenance), because the road is still in good condition, do not need maintenance… I think it does not need (to be maintained) every year. I think it will be only after three or two years that it breaks. Because the traffic passing the road is not more than 10 tons." – CS08*

CS08's comment above regarding the road maintenance issue demonstrates the poor understanding of the local governments on the importance of providing regular road maintenance. Accordingly, it came to no surprise that the local governments of Aceh Jaya simply neglected the road maintenance needs. This was confirmed by CS09 by stating that the road maintenance allocation was given intermittently, and occasionally no allocation was made at all. As he described

> *"Maintenance (allocation), it is not certain. It seems that this year there is no maintenance. Not at all. It is focused on upgrading and new construction." – CS09*

In addition to the total neglect of the routine maintenance, CS10 added that the local government of Aceh Jaya did not recognise maintenance works. The method they adopt for the development of road infrastructure was a sequential approach. The road development process was explained by CS10

"The first phase is to open (new road), gravel. Two years later, we allocate budget for upgrade. To be paved. So we don't recognise maintenance works there. We only have upgrades. We upgrade them to asphalt pavement… No maintenance." – CS10

As described by CS10 above, the road development process would start by the Local Governments initially open up a new area and construct the gravel roads. The following phase would be to provide the budget allocation for the gravel road to be paved. Until the gravel roads get paved, no maintenance intervention was planned and allocated for the new gravel roads. The justification of such neglect was further given by CS10

"We go straight to upgrade… instead of spending money for the maintenance which in two years later we would also need to maintain again." – CS10

The argumentation that CS10 put forward undermined the necessity and the objective of road maintenance. As explained in section 2.4.2, road construction would start to deteriorate immediately after the construction is complete. Maintenance intervention is accordingly provided to reduce and slow down the deterioration pace, restore the structural condition, and eventually extend the design life and reduce the life cycle cost. Taking CS10 illustration as an example, the provision of regular maintenance works to the gravel roads may accordingly delay the needs to upgrade, or in certain cases may even diminish the need to upgrade the roads at all.

5.8.2.3 Staffing

Similar to the previous case study district, the execution and implementation of the road maintenance works in Aceh Jaya also used a force-account method, i.e. using the in-house personnel. One of the justifications for using the force-account method as suggested by CS10 was due to the limited budget availability. He explained

"Due to the limited budget, we plan ourselves, unpaid, not using the consultant… we do it ourselves, using our own equipment. We only need to calculate the cost of the fuel and mobilisation." – CS10

CS10 further justified that by using the force-account method, the agency would be able to save costs and consequently able to extend the length of the road section that can be covered by the budget.

"If it's done by the partners (contractors), they may only build 2km (for example) as they are profit-oriented. Our orientation is to open the isolated areas. If we do it ourselves, then we may open up to 5km." – CS10

The analysis of the maintenance strategy of the case study two have been discussed in this section. The cognitive map of the analysis is presented in Figure 5.32 down below.

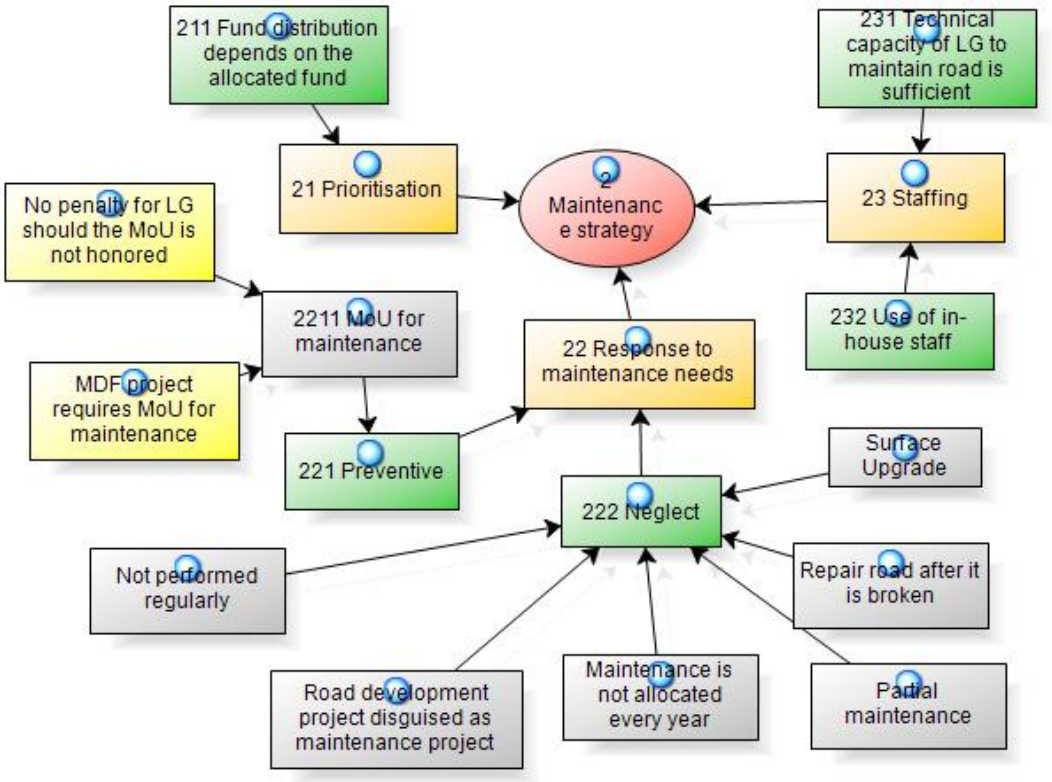


Figure 5.32 – Cognitive map of the maintenance strategy of case study two

As the maintenance strategy analysis have been presented, the following section will accordingly present the analysis of the capacity building in road maintenance of the case study two

5.8.3 Capacity building in road maintenance

5.8.3.1 Capacity building approaches

With regards to the capacity building in road maintenance, CS12 suggested that reconstruction of road infrastructure in post-disaster context beyond the original condition is reasonable as

long as it accompanied by appropriate capacity building programs. He further added that such capacity building programs should be aimed at both the local governments and the private sectors, in this case, the professional consultant who would assist the local governments. As he said

> *"I am sure that when the capacity improved, practically the mind-set of the people would also change. And most attitudes are affected by the level of knowledge" – CS12*

5.8.3.2 Capacity building challenges

With regards to the capacity building in road maintenance, lack of funding was also accused to be one of the main challenges. Interviewee CS08 argued that the local governments' personnel really needed to be involved in capacity building activities such as trainings and seminars, but was challenged by the lack of fund to participate and attend the events. As he explained

> *"We really need trainings, such as in the area of technical guidance, budgeting, and data-based planning, for instance. We received a lot of invitations, but was hindered by the lack of budget… So even though the invitation letters keep coming in, they are ignored as there are no budget" – CS08*

In addition to that, CS10 supported CS08's comments and suggested that the local personnel had not received trainings with regards to road maintenance. Similarly, the lack of budget to participate in such events was also accused to be the reason. Consequently, CS10 explained that the local governments' personnel mostly learned from the more senior staff. He explained

> *"There has never been budget allocation for that (trainings). We did submit a request, but has never been approved. Probably because the budget is limited. Accordingly, so far we learn from the senior staff, learning from their experience" – CS10*

The issues surrounding the capacity building in road maintenance of the case study two have been analysed in this section. The cognitive map of the analysis is presented in Figure 5.33. Accordingly, the following section will present the analysis of the post-disaster road reconstruction success indicator as perceived by the respondents of the case study two.

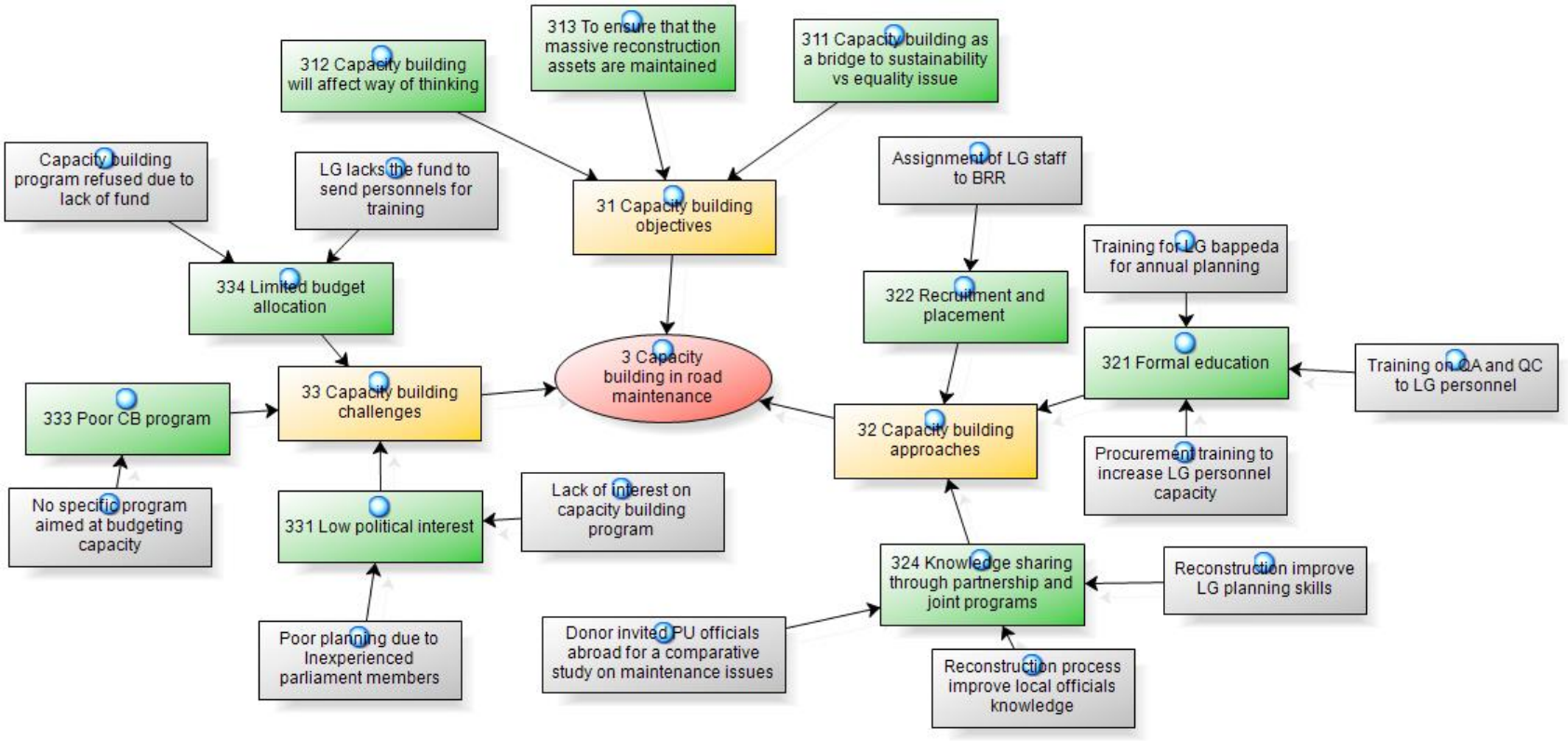


Figure 5.33 – Cognitive map of the capacity building in road maintenance of the case study two

5.8.4 Post-disaster road reconstruction success indicator

5.8.4.1 Disaster impact recovery

One of the success indicators of the road reconstruction was with regards to the impact of the reconstruction to the recovery pace. The interviewees generally perceived that the reconstruction of the road infrastructure had largely contributed to the speedy recovery of the tsunami affected areas. This was also argued to be the case in Aceh Jaya. As confirmed by CS09, the reconstruction of the road infrastructure in Aceh Jaya district was considered to be successful, particularly as indicated by the rapid development of the affected areas. CS09 confirmed his view by saying

> *"(It was) successful. The indicator is that I see many areas have developed. Recovered." – CS09*

5.8.4.2 Improved road Infrastructure condition

5.8.4.2.1 Wider network coverage

With regards to the road network coverage, CS13 also suggested that the impacts and benefits of the road infrastructure reconstruction could also be seen in the improved quantity and quality of the road infrastructure. He further added

> *"If we look at the success indicators, first is the quantity. The (required) quantity was met. In fact, it was more than (what was stipulated) on the blue print." – CS13*

In addition to the length of the road sections repaired during the post-disaster reconstruction period, the quality of the reconstructed road was also believed to have better quality. As argued by CS13,

> *"From the quality aspect. We see that the quality is still good until today, even though it has been 5 years." – CS13*

Additionally, CS10 also suggested that the post-disaster road reconstruction process had also resulted in the better road infrastructure condition. Comparing the post-reconstruction and the pre-disaster condition, CS10 illustrated

"If we mark it from 0 to 10… now is around 7. Why? Because the access has been recovered, compared with the pre-tsunami condition… If we give marks, the pre tsunami was 5, now it is 7." – CS10

5.8.4.2.2 Reduced travel time

Another positive impact and indicator of road reconstruction success in Aceh Jaya was the reduced travel time. CS10 suggested that the travel time between Banda Aceh and Calang, for instance, had been reduced to 2 hours, instead of 3 hours as it was before the tsunami.

"The access is also better. Previously (prior to the tsunami), Banda Aceh to Calang would need 3 hours. Now it will need only 2 hours. So from the transportation perspective, it is better." – CS10

5.8.4.3 Socioeconomic condition

From the socioeconomic perspective, the road reconstruction was also perceived to have provided positive contributions to the economic development of the community. CS10 illustrated the improvement by referring to the apparent growth of the vehicles in Aceh Jaya.

"The income (of the community) has also improved… and with regards to the number of vehicles, there used to be only motorcycle, and was limited, and now there are many cars. From that alone, we can see the improvement." – CS10

And also from the type of houses build by the community

"There used to be many houses made of timber. As the road network improves, the economic condition also improved. Therefore the community's income also improves. As a result, more houses become the permanent (bricks) ones." – CS10

The positive impact of the road reconstruction process to the socioeconomic condition of the people in Aceh Jaya was also confirmed by CS09. He said

"(The reconstruction of the roads) really help the economic development of Calang." – CS09

This section concludes the analysis of the post-disaster road reconstruction success indicator as perceived by the respondents in the case study two. The cognitive map of the analysis is presented in Figure 5.34

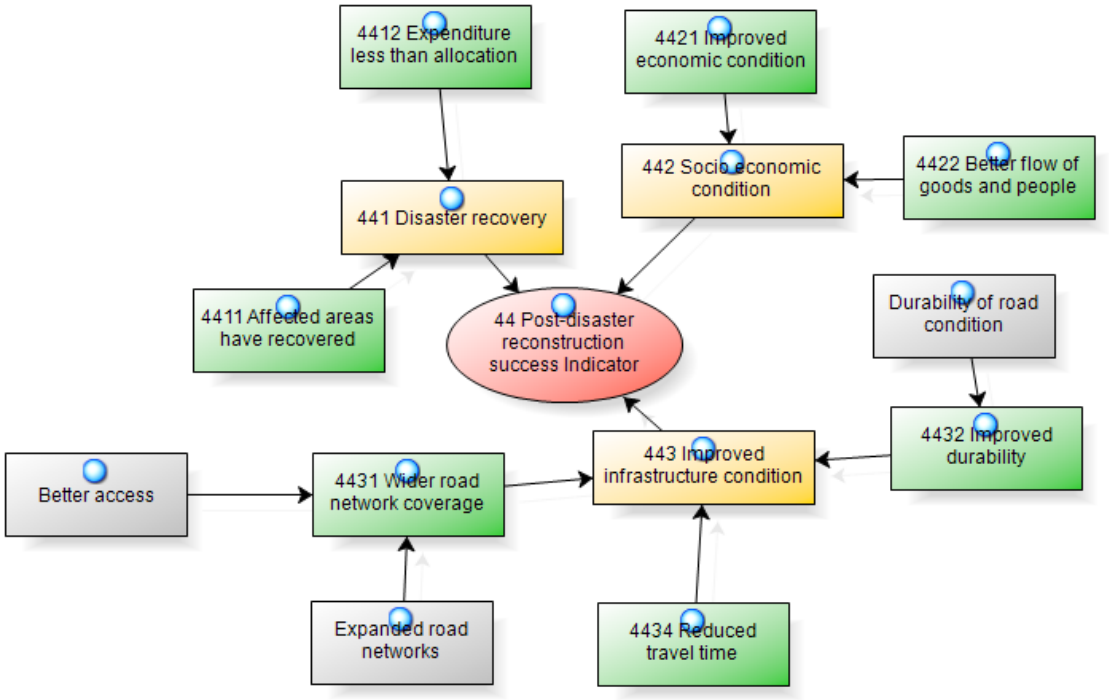


Figure 5.34 – Cognitive map of the post-disaster road reconstruction success indicator of the case study two.

The above sections have provided an in-depth discussion on the road maintenance issue in the district of Aceh Jaya. Accordingly, the following section will provide a discussion about the third case study of the research, Aceh Barat Daya.

5.9 Analysis of case study 3 – Aceh Barat Daya

5.9.1 The maintenance capacity affecting factors

5.9.1.1 External factors

The external factors for the road maintenance are those which are beyond the direct control of the road authorities. Accordingly, these external factors will be elaborated in the following sections.

5.9.1.1.1 Environment

The analysis of the second study case district reveals that the environmental issue that was affecting the capacity of the local government of Aceh Jaya in road maintenance was regarding

the vast area of the district and the consequently long road networks. Similarly, the Local Government of Aceh Barat Daya was also overwhelmed by the extensive length of their road networks. As expressed by CS16, the local governments were overwhelmed with more than 1200km of road networks in the district.

Apart from the vast area of the district and the resulting lengthy road networks, there were no other environmental issues emerging from the interviews which would affect the capacity of the local government in the road maintenance.

5.9.1.1.2 Political

The political pressure from the parliament was also experienced by the road authority in Aceh Barat Daya, particularly in determining the project locations. CS14 expressed that on the one hand distributing wealth to the community in the form of dispersing road project locations is crucial for the development of an area. He also agreed that the distribution of budget allocation to different locations was necessary to address the various community needs at the different locations. On the other hand, however, the development should also be implemented based on the priority. This condition was seen as a dilemmatic decision by CS14. He also suggested that the road maintenance works were actually technically more preferable to the road authority personnel as they were easier to do, but he was more concerned with the parliament pressure. As he said

> *"Really, it is a very dilemmatic issue for us. From the community perspective, the distribution of wealth is a must. It is even becoming more necessary when it is related to the parliament. They will insist it." CS14*

Even though the road maintenance neglect was accused as a consequence of the high political pressure on the capital projects, the road authority in Aceh Barat Daya also seemed to have little interest in the maintenance works as the project value was relatively small. This view was expressed by CS16 by saying that the level of damages of the road infrastructure was too small to be listed as a project. He said

> *"The problem is that if there are damages to the road, the damages are small… What I mean is if we do it as a project, it will be small." – CS16*

In a different occasion, CS18 also expressed similar opinion to the low interest of the road authorities on the road maintenance works. CS18 explained due to the small value of maintenance works, the road authorities tend to wait until the damage level have escalated to a level where the repair works are worth working for. He said

> *"Not many are interested (in road maintenance), because the money involved is minor… because of the small value, (they would think) this is easy, I think so. So the motivation to repair escalates if the roads have had big holes (heavily damaged)." – CS18*

5.9.1.1.3 Socioeconomic factors

The interviewees from Aceh Barat Daya also raised the issue of getting the social pressure from the community. Consequently, the Local Governments of Aceh Barat Daya tended to expand their road networks in order to provide access to the wider areas, and to avoid any social jealousy between the communities, which may lead to a greater social problem. When asked whether the Local Governments should put its focus on the road maintenance or expanding the road network, CS15 confirmed his view by saying that

> *"For road infrastructure, I am more towards distribution (expansion)… This is because it may otherwise cause social jealousy between one area and another area. This may also create problems to the Local Governments." – CS15*

Additionally, similar view was also seen in the Aceh Barat Daya district regarding the economic impact of road network expansion compared with the road maintenance. As a result, there seemed to be a consensus between the road authorities that the development of the road infrastructure need to be translated as expanding the road networks to the maximum extent possible. CS14 based his support by arguing that because the district was poor, expanding the road networks and developing the new areas was the way to improve the economic level of the community. As he said

> *"Indeed, we are a rather poor district, so that the maintenance of road has not been very well. We focus more on the development of new areas which can improve the economic level, such as access roads to the farming areas.*

5.9.1.1.4 Safety and Security

The implementation of road projects in Aceh Barat Daya also experienced a number of safety and security issues. The safety and security issue occasionally turned into disruption of project implementation. As explained by CS15 and CS14, the safety and security threats from the individuals or the community during the project implementation were experienced widely in the district of Aceh Barat Daya, which was frequently due to the disputes on the land acquisition process. However, even though the road maintenance works did not normally involve land acquisition, CS14 revealed that the security threat might also occur when the awarded contractors were not from the local area, or if they were not welcomed by the local community. He explained

> *"If the contractors who won the tender are not the local people, the community sometimes gets upset. Occasionally, even if the contractors were local people, but they didn't like them, it would still get disrupted." – CS14*

Additionally, CS14 also added after the peace agreement was achieved in 2005, there has been no obstacles in implementing road maintenance works from the security and safety aspect. He said

> *"After the peace agreement, there are no more obstacles." – CS14*

Additionally, further discussion with CS14 revealed that the diminishing obstacle meant by CS14 above was referred to the ability of the local government to implement a project in certain areas, which was virtually impossible during the conflict period. However, it was suggested that disruptions in the project implementation were still experienced coming from the KPA (ex-combatant) members after the peace agreement. CS15 suggested

> *"As a post-conflict area, the impacts of the conflict still remain. Some people would consider themselves as the local mafia here, it certainly still exists. "- CS15*

Similarly, CS14 further described that the local mafias referred by CS15 were actually the ex-combatants associated in the KPA (Aceh transformation committee). He added

> *"Some people, labelling themselves as KPA representatives, the ex-combatants, would try to collect 'Pajak Nanggroe' (country tax). But after they had been given an explanation,*

they would understand. They would eventually ask for a job, whether as a supplier or as the construction personnel for the project." – CS14

CS14 further confirmed that the illegal extortion of the 'Pajak Nanggroe' still existed even after the peace agreement. He said

"Until today it is still happening. Even though not to a scale where it may hinder or cancel a project." – CS14

The above sections have provided an in-depth discussion on the impact of the external factors to the capacity of the local government in the road maintenance. As the analysis of the external affecting factors has been presented in this section, the cognitive map of the analysis is detailed in Figure 5.35. Accordingly, the following section will discuss the internal factors of the road maintenance capacity, initiated by the discussion of the institutional factors.

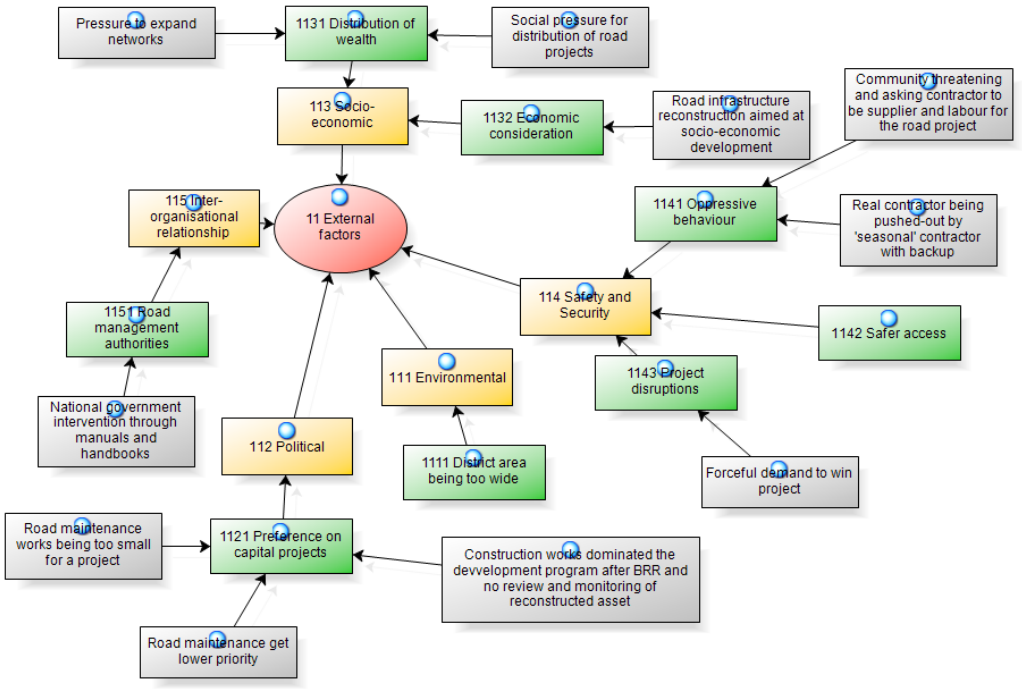


Figure 5.35 – Cognitive map of the external affecting factors of the case study three

5.9.1.2 Institutional factors

5.9.1.2.1 Financial Management

From the financial management point of view, the analysis of the interviews with the representatives from Aceh Barat Daya did not show a similar pattern with the previous case study districts. Whilst the insufficient allocation for the road maintenance was also experienced in Aceh Barat Daya and in fact was one of the major causes of the road maintenance problem, there were no indications emerged from the interviews that the road maintenance allocation was spent ineffectively. However, the issue of unspent budget allocation was experienced generally in Aceh Barat Daya. More details on the financial issues will be presented in the following sections.

5.9.1.2.1.1 Fund is not allocated in sufficient amounts

One of the main reasons to the insufficient allocation for the road maintenance is that road maintenance needs lose their priority when they have to compete with other needs, either with the needs in the road sector or with other needs in the other sectors like health and education. Accordingly, the lack of funds is often used to justify the road maintenance neglect.

Regarding the maintenance of the infrastructure facilities, CS15 suggested that the maintenance needs did not get high priority in the district budget. Consequently, it would commonly receive small allocation. He stated that the government always allocated its budget for the maintenance needs, even though in a limited amount.

> *"We can maintain… almost every department allocate budget (for maintenance)… even though it is not really a priority in the district budget... Since it is not a priority, even though there is allocation (for maintenance), it is not so big." – CS15*

Even though the road maintenance budget insufficiency was experienced widely, CS18 suggested that the main financial issue rooted in the capacity of the local government to prioritise and distribute the limited budget allocation. The Local Governments' capacity in budgeting was also seen as a threat to the road maintenance. He argued that the willingness and the capacity of the Local Governments in setting up priorities of their budget expenditure were the actual problems of road maintenance. CS15 further described that the maintenance needs always lost their priority to other capital expenditure. The capital projects were seen as

the 'real needs' as they might give immediate and direct results compared to the maintenance project. He said

> *"It always loses to other capital expenditure. It is not considered a real need. Not a priority. So if there is (allocation), it is not so big." – CS15*

Nevertheless, CS15 further added that one of the causes of small budget allocation was also because the district of Aceh Barat Daya had a low district original income.

> *"There are many other (needs). And annually, we always have limited budget allocations because our original income is smaller at the district level." – CS15*

In addition, due to the competition with other sectors, and even with other activities in the road infrastructure sector, the maintenance of road infrastructure tended to get lower priority. One of the excuses to this problem was expressed by CS14 that even though in damaged condition, roads are still passable and therefore road development was focused on expanding road networks and to keep the road access open. Accordingly, the road maintenance needs in Aceh Barat Daya did not seem to be considered as an important item in the work plan. Therefore, the budget for the road maintenance was also not allocated regularly in the annual budget plan. This was confirmed by CS16

In addition to the lack of fund, CS18 emphasised his concern and warned that even though the post-disaster reconstruction resulted in a large number of new assets and therefore increase the needs of the operation and maintenance allocation, it will be difficult for the local government to suddenly change the pattern and trend of their budget expenditure. CS18's emphasis was referred to the resulting political pressure and complaints coming from the other sectors if their annual budget allocations were suddenly and drastically decreased for the benefit of the road infrastructure

5.9.1.2.1.2 Fund allocation is not spent

In addition to the budget sufficiency, the paradoxical issue regarding the financial concern is that the annual budget allocation is not spent by the end of the fiscal year. This was also the case in Aceh Barat Daya. For the period of seven years between 2006 and 2012, the budget

expenditure ratio in Aceh Barat Daya varied from as low as 35% to more than their budget availability, 101.6%. More detail of the annual budget expenditure is shown in Table 5.20.

Table 5.20 – Annual Budget Realisation of Aceh Barat Daya

Year	*TOTAL INCOME*	*TOTAL EXPENSES*	*REALISATION*	*UNSPENT ALLOCATION*
2006	***Rp 267,715,880,000***	***Rp 272,112,940,000***	***101.6%***	***Rp -4,397,060,000****
2007	***Rp 334,081,521,722***	***Rp 118,624,573,527***	***35.5%***	***Rp 215,456,948,195***
2008	***Rp 354,295,232,180***	***Rp 340,008,240,464***	***96.0%***	***Rp 14,286,991,716***
2009	***Rp 310,441,886,204***	***Rp 302,019,306,059***	***97.3%***	***Rp 8,422,580,145***
2010	***Rp 346,559,726,913***	***Rp 327,414,791,217***	***94.5%***	***Rp 19,144,935,696***
*2011***	***Rp 433,603,231,367***	***Rp 384,424,128,666***	***88.7%***	***Rp 49,179,102,701***
*2012***	***Rp 547,451,505,902***	***Rp 520,856,511,333***	***95.1%***	***Rp 26,594,994,569***

Source: DJPK (2014)
****Overspent allocation***
*****Data from DPKKD Aceh Barat Daya, (£1 ~ Rp 20,000)***

As shown in Table 5.20, the government of Aceh Barat Daya district had not been able to spend their entire annual budget allocations. However, compared to the other case study districts, the budget realisation ratio of Aceh Barat Daya appears to be higher, with the exception of the 2007 fiscal year. Restating the previous notification regarding the unspent budget allocation, the budget expenditure realisation ratio may affect the allocation of the following year, in order to represent the actual budget spending capacity.

5.9.1.2.2 Human resources

From the human resource perspective, the local government of Aceh Barat Daya also experienced some issues. As a relatively new district (Aceh Barat Daya was established in 2002), CS15 disclosed that the personnel recruitment system in the district was poor. He explained that the high officials in the local government institutions in Aceh Barat Daya were generally former (old) school teachers, who had enough year-of-service in the government to fill the high level positions. CS15 explained

> *"The capacity of our (human) resources is limited… We are new district… generally the high officials here are teachers who met the minimum rank requirement." – CS15.*

In the Indonesian government system, each government personnel would have a rank given based on their year-of-service in the government or their work function. In the case of Aceh Barat Daya, the teachers were recruited and reassigned to the different government institutions due to the high-rank requirement for the positions in the newly established institutions. Since after the separation of the districts most of the high officials of the technical agencies stayed in the main district of Aceh Selatan, it was then these experienced teachers whose workplace were physically located in the new Aceh Barat Daya district who met the requirement for the top positions.

However, the impact of such recruitment system was that the high officials appointed as the head of the government institution or work units might not have the required skills in accordance with the agencies they were leading. As a result, the quality of the work was accordingly questionable.

5.9.1.2.2.1 Planning capacity

From the road maintenance planning aspect, the road authority of Aceh Barat Daya was too experiencing an issue with the road management and information system. As stipulated by CS15, every year the road authority allocated a certain amount of budget allocation for the road maintenance needs. However, the extent to which the budget allocation had contributed to solving the road maintenance problems was not known. As CS15 explained

> *"For the district roads… every year there will be budget allocation for maintenance… But how far, the level of success to solve road problems, I do not have the answer." – CS15*

Accordingly, CS15's comment suggested that the Aceh Barat Daya districts appeared to lack the mechanism or system to evaluate their road maintenance performance and the impact of the road maintenance interventions that they have performed. Furthermore, CS16 added that the public works also lacked of reliable road data. He described that the road data they collected was done manually and based on rough estimate. As he said

> *"Here in Aceh Barat Daya, we do it (collect data) ourselves. And the data collection system is done manually, we make rough estimates of the length of the particular road sections."- CS16*

Since there had been no accurate information about the road data, it would then be difficult to estimate the actual maintenance needs and accordingly to justify the budget allocation proposal for the road maintenance to the parliament.

This section has presented the analysis of the institutional affecting factors of the case study three. The cognitive map of the analysis is presented in Figure 5.36. As the institutional factors have been covered, the following section will accordingly present the analysis of the technical factors.

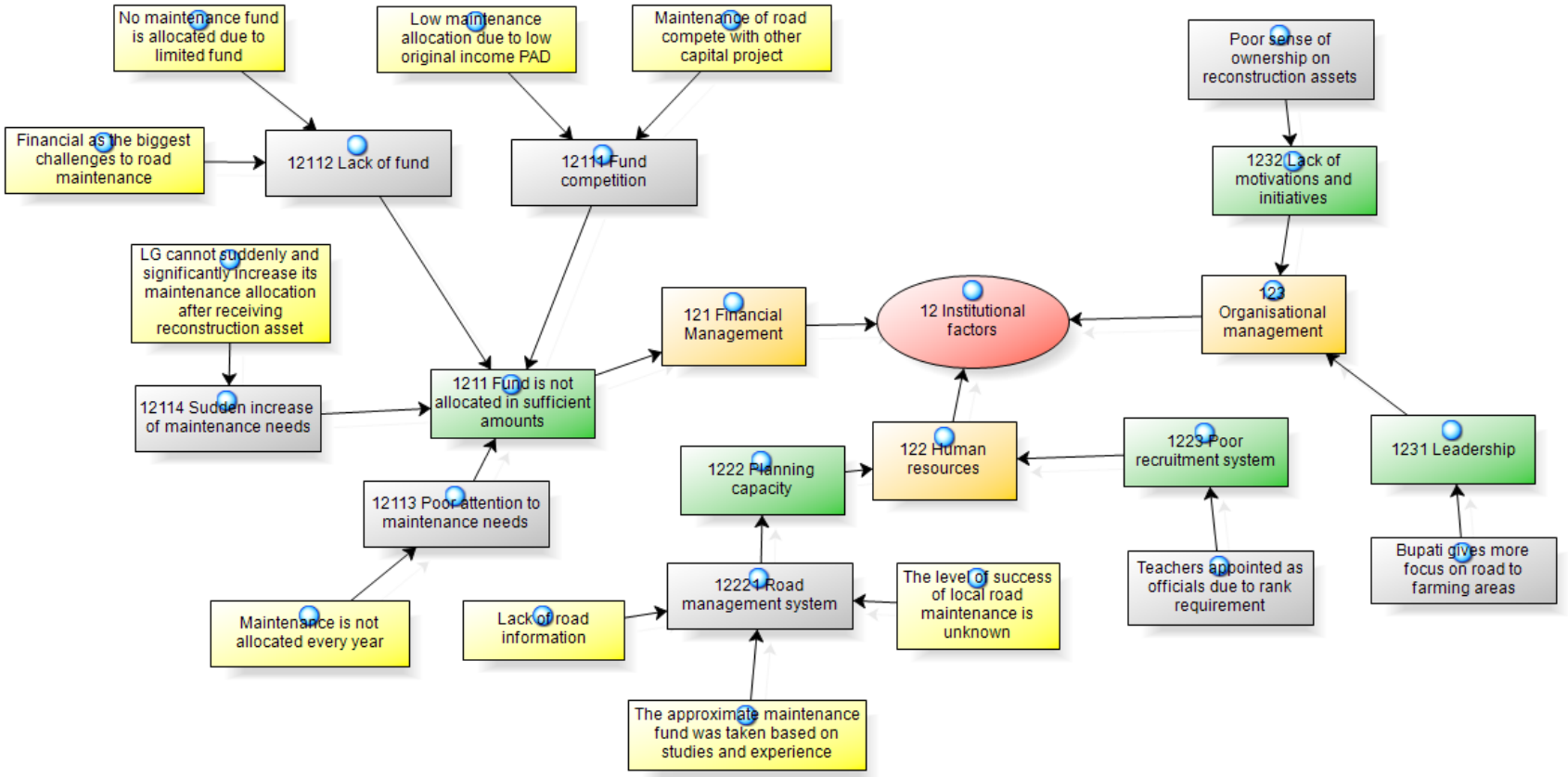


Figure 5.36 – Cognitive map of the institutional factors of the case study three

5.9.1.3 Technical factor

Overloading traffic did not emerge as a major concern in Aceh Barat Daya in terms of the maintenance of district roads. In fact, as suggested by CS14, one of the reasons that the district roads in Aceh Barat Daya were still in good condition was because the traffics passing the district roads were relatively lightweight vehicles. As expressed by CS14

> *"Probably, the overloading traffic, heavy equipment, and so on are still minimal. Thus, our existing roads are more durable. The damage is less, and it would take longer to deteriorate…" CS14*

Another similar view was also expressed by CS16. When asked if the transportation of construction materials had resulted in any negative impacts to the road infrastructure, he said

> *"I don't think there is any impact. Up until this year there have been no impacts." – CS16*

However, even though NG05 did not think there had been any negative impacts from the transportation of construction materials in the area, he expressed a concern that it might have an impact in the near future, as there would be more construction activities in the settlement areas. He said

> *"Maybe in the future… because more of the roads are having Hotmix design… it starts to reach the settlement areas… more transportation (of construction materials)… The way they transport it… that will have impacts as the roads are small (in the settlement areas)." – CS16*

The concern that CS16 raised above indicated a growing threat of the rapid road deterioration in the near future.

The above discussion concludes the analysis of the technical affecting factors of the case study three. The cognitive map of the analysis is presented in Figure 5.37.

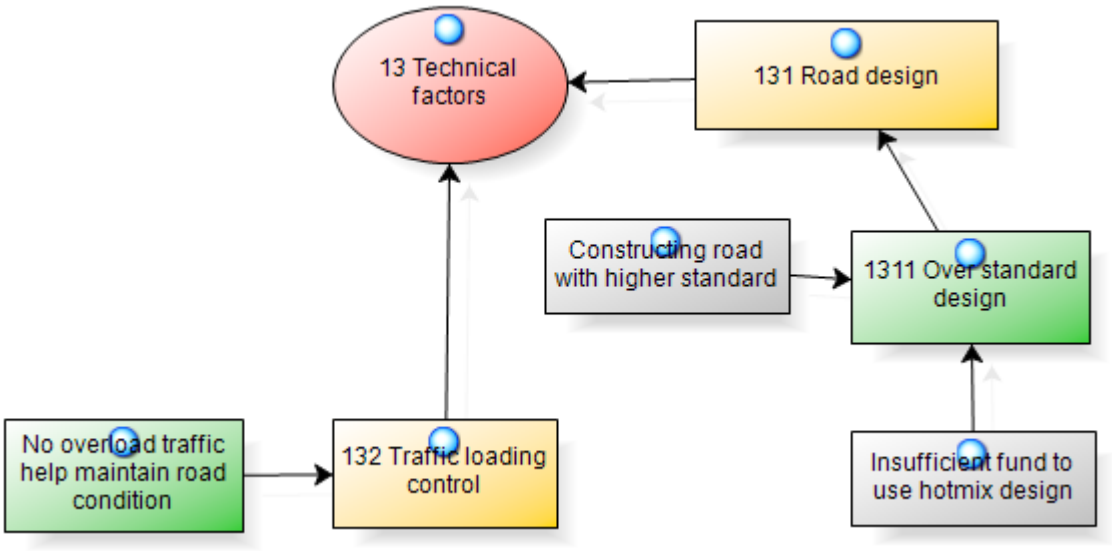


Figure 5.37 – Cognitive map of the technical affecting factors of the case study three

As the road maintenance affecting factors of the case study three have been elaborated in this section, the next section will accordingly present the analysis regarding the maintenance strategy of the case study three.

5.9.2 Maintenance Strategy

5.9.2.1 Response to maintenance needs

5.9.2.1.1 Neglect

With regards to the response of the local government on the road maintenance needs, similar condition was experienced in Aceh Barat Daya. Due to the lack of financial resources, the road maintenance needs did not regularly receive budget allocations. Additionally, even when the road maintenance received budget allocation, it would be used for major maintenance works only. Hence, similar to the previous case study districts, routine maintenance was simply neglected. This condition was explained by CS16. He said

> *"For maintenance, in the upcoming year, we won't do. But in the previous years we did. But only maintenance of roads with puddles (potholes), we patch and repair." – CS16*

Furthermore, the maintenance 'strategy' adopted by the Aceh Barat Daya district was also to neglect maintenance needs and to directly upgrade the road surface when fund became available. CS14 described the road surface upgrading process as the following

> *"Our focus is for the roads in the settlement areas to be upgraded. From dirt roads to gravel, from gravel roads to macadam. Later on, if possible, if there is budget allocation, they will also (be upgraded) to Hotmix." – CS14*

CS14 explanation suggested that there was no indication that the road infrastructure would get maintenance intervention in order to ensure that the road was kept in good condition.

5.9.2.1.2 Contractors' voluntary contribution

Whilst the local government of Aceh Barat Daya would generally neglect the maintenance needs due to the limited budget availability, the road maintenance works in the area would also be performed by the contractor. CS16 and CS14 explained that the strategy adopted by the local government of Aceh Barat Daya was to ask contractor working in a nearby road project to informally and voluntarily do the maintenance works for them. As expressed by CS16

> *"(if) there are any damages in a particular road section, if there was a project running in that section, then we would ask the project packages (the contractor) to repair them on the go, because the damage level is also not so big." – CS16*

CS14 also added a similar comment on the use of contractor as a means to help solving the road maintenance problems. He said

> *"Nowadays, we would ask for help (from the contractor). No maintenance… because we don't have the budget allocation for that… If there was a pavement project nearby… we would ask the contractor to pave the potholes as well." – CS14*

Having to do extra jobs unpaid, CS14 further explained that the contractors did not object and complain on the request. He said

> *"They did not complain. Because we told them that this was to help the district, not to help the individuals in the public works." – CS14*

This section has covered the analysis of the maintenance strategy of the case study three. Accordingly, the cognitive map of the analysis is presented in Figure 5.38.

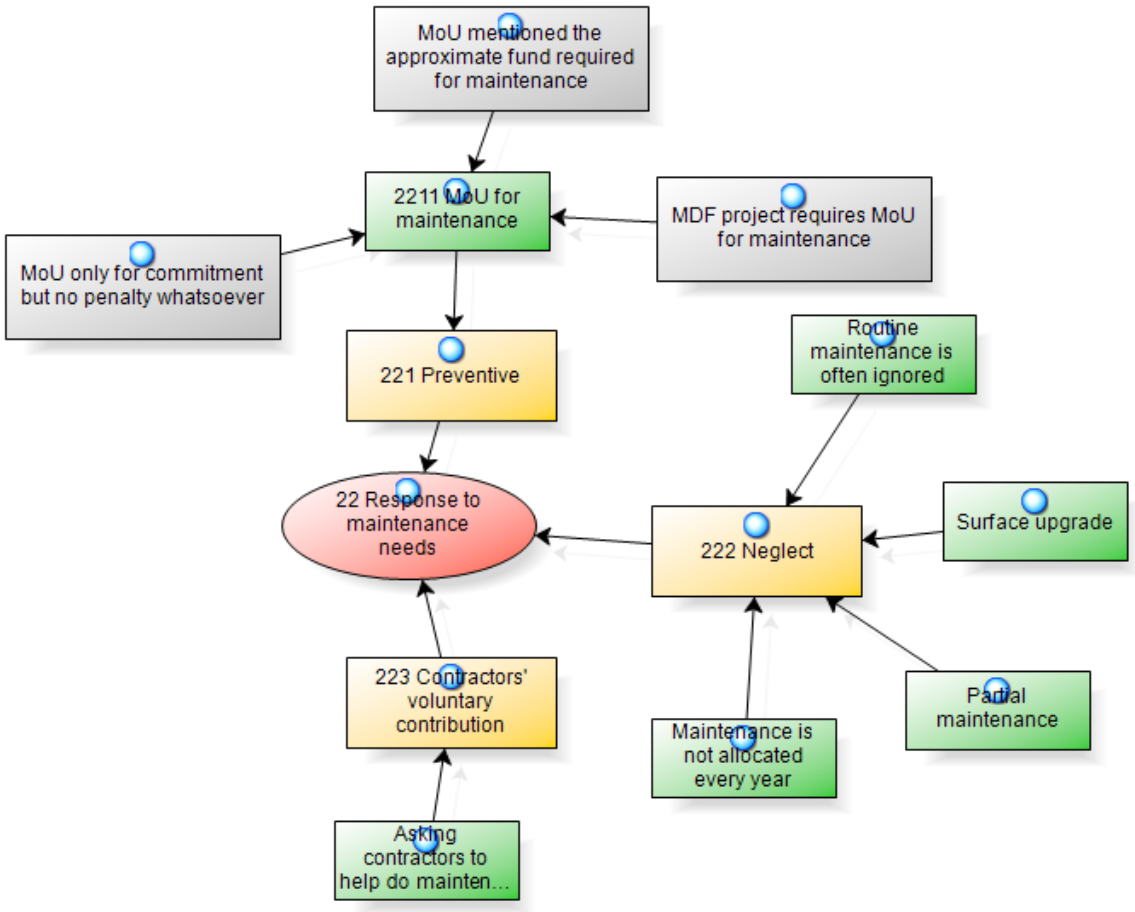


Figure 5.38 – Cognitive map of the maintenance strategy of the case study three

As the maintenance strategy of the case study district has been discussed in the section, the following section will accordingly present the analysis of the capacity building in road maintenance of the case study three.

5.9.3 Capacity building in road maintenance

5.9.3.1 Capacity building approaches

The capacity building programs in Aceh Barat Daya were also conducted in various approaches. As summarised from the discussion with the interviewees, the capacity building approaches included the provision of trainings and workshops, recruitment and placement in the BRR, procurement of tools and equipment, as well as knowledge sharing through partnership and joint programs.

As described by CS15, the local government personnel regularly received trainings from the central government for the procurement of goods and services. However, whilst he admitted that the procurement trainings were necessary, he expressed the necessity to have more various trainings provided to the local government personnel.

> *"Well, only goods and services procurement (training). And it is done by the central (government). That's it… That is what has been annually done." – CS15*

A similar thought was also expressed by CS14. He suggested that the local government personnel used to receive trainings for the construction technical skills during the post-disaster reconstruction period, but not now. He said

> *"There were trainings to improve the personnel quality. In the form of workshops... about the construction technical issues." – CS14*

Additionally, CS16 also expressed the benefit of having the trainings and workshop to the local personnel. Particularly mentioning the portable bridge construction workshop, he suggested that the skills remained with the local personnel, and that they were now able to install the bridge themselves. He said

> *"For the non-road infrastructure… the bailey (portable) bridge, we know now how to install it. The steel frame (structure), at least we know it now." – CS16*

In addition to receiving trainings and workshop, the local personnel were also recruited and posted in the BRR. As suggested by CS16, the public works of Aceh Barat Daya was involved in the reconstruction process and at the same time had its personnel recruited into the BRR. He further argued that such an arrangement lead to a better communication between the local governments and the BRR. He said

> *"Obviously we were involved, and the personnel were also involved. They were recruited from the respective departments… Even more, for the road sector, the (BRR) office was also near to the public works. So the communication… was also (better). And the personnel were recruited from the Public works. So it matched better." – CS16*

Similar to the other districts, the capacity building in Aceh Barat Daya also took place in the form of the procurement of tools and equipment, which generally accompanied by the provision of trainings for the tools and equipment operators. As suggested by CS14

> *"BRR provided, helped us with heavy equipment such as the grader. And there was also lab equipment. We were also invited to have training in the lab… so that we can use the equipment." – CS14*

Furthermore, CS14 rose that the local government also learned from the national consultant that assisted them during the post-disaster reconstruction process. As CS14 expressed

> *"What I had been observing, the (national) consultant that used to help us, with regards to experience and knowledge, they are more (knowledgeable) than us… we even learned from the consultants." – CS14*

In contrast, CS14 also suggested a different experience if local consultants were involved in a project. In a project where local consultants were involved, he argued that the local government personnel frequently had to teach the consultants and tell them what to do. He said

> *"In the district, it was us who teach the consultant. This is not allowed, that is not according to the specification, you should do this and this… But them (the national consultant), they informed us. If we say this and this, (they may say) this is not according to the specification." – CS14*

He further confirmed that the road reconstruction process had indeed given benefit to the local government in terms of knowledge sharing. He said

> *"It's true. From the road sector perspective, it's true." – CS14*

5.9.3.2 Capacity building challenges

The capacity building program in Aceh Barat Daya also saw the poor political interest as a barrier in the capacity building effort. As suggested by CS14, in addition to the limited budget availability, the parliament did not see capacity building as an important component of the development. Accordingly, the parliament was more interested in delivering physical

construction projects, particularly since the impact was more visible to the community. He explained

> *"We are constrained by the budget. First, our budget is limited. Second, it's regarding the parliament's approval of the budget. Occasionally, the parliament, with regards to capacity building program for the personnel, does not consider it as important. They tend to be more interested in the physical (construction). More visible to the community." – CS14*

Supporting CS14's view, CS15 also highlighted that the district of Aceh Barat Daya was actually required a lot of skilled personnel to fill the various positions and expertise requirements in the local government.

> *"Trainings are also limited. Not sufficient. In fact, there are many skills needed to be provided to the Local Government personnel, but there aren't." – CS15*

With regards to the low awareness on the importance of the capacity building programs, CS15 also revealed that there were no scholarship programs provided for the local government personnel to continue their formal education to a higher level, apart from the medical doctor, which was considered as the most required skills in the district. He added

> *"From the district (governments), (capacity building program) for the personnel is poor… There are no such things like scholarship from the Local Governments for the Local Government personnel…" – CS15*

Another issue highlighted by the interviewees in Aceh Barat Daya was regarding the inappropriate educational background of the local government personnel. CS15 stipulated that the district development planning agency lacked the personnel with an urban planning degree. He argued that this condition was due to the lack of awareness of the local governments on the human resource needs. He said

> *"I think the problem is maybe due the poor awareness of the Local Governments themselves towards human resources needs. For example, in the infrastructure, we need planning personnel. We don't have bachelor (engineers) in urban planning." – CS15*

He further argued that as a relatively new district, Aceh Barat Daya would require skilled town planning personnel. Particularly since the infrastructure development activity was high. He argued

> *"Actually, in the process of planning, in a new district like this, where the infrastructure development (activities) are high, there need to be a town planner who understands urban planning, spatial planning, but there is none." – CS15*

He added

> *"The last time we did the spatial planning, we only used (civil) engineering personnel who understand GIS. They haven't got even the basic knowledge of urban planning, or spatial planning… They are not even experts in mapping… They just know how to make map (use the software)… – CS15*

On the one hand, the political condition was accused as one of the main causes of the poor capacity building program. On the other hand, however, the gap in the personnel existing capacity was also suggested to be among the causes of the slow progress of the capacity building efforts. One of the reasons of the aforementioned problem was argued by CS17 due to lack of personnel with appropriate educational background.

Furthermore, CS14 added that hiring local consultants to assist the local governments did not seem to be a proper solution to the local government poor capacity problem. As discussed in the previous section, with regards to taking advantage from the local consultant to assist the government, CS14 said that instead of receiving assistance, it was the local government personnel who frequently gave advice to the local consultant on how to do the work. He highlighted

> *"In the district, we in fact teach the consultant." – CS14*

The analysis of the capacity building in road maintenance of the case study three has been presented in this section. The cognitive map of the analysis is presented in Figure 5.39. Accordingly, the analysis of the case study three will progress to the issue of post-disaster road reconstruction success indicator in the next section.

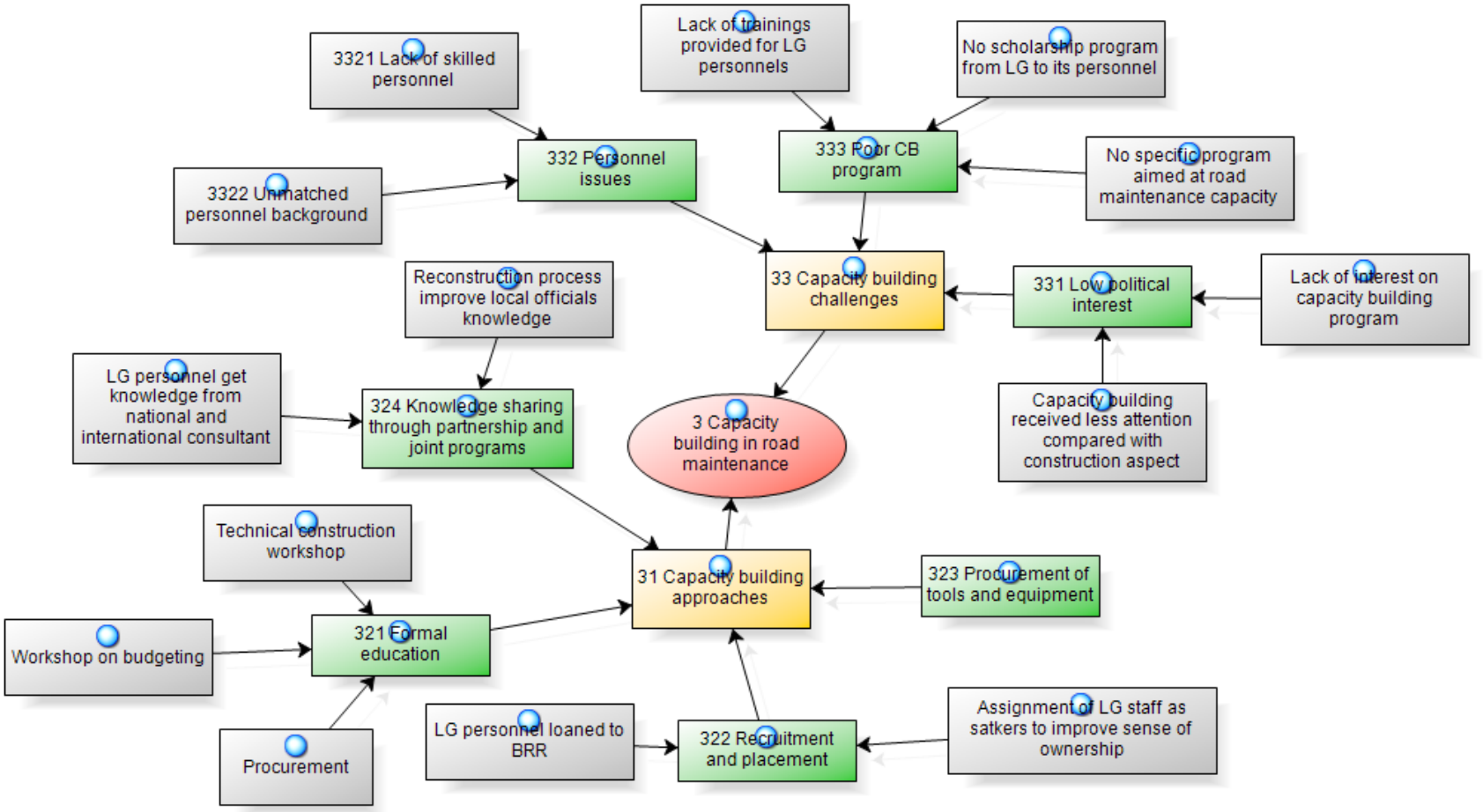


Figure 5.39 – Cognitive map of the capacity building in road maintenance of the case study three

5.9.4 Post-disaster road reconstruction success indicator

5.9.4.1 Improved road Infrastructure condition

The benefit of the road infrastructure reconstruction in Aceh Barat Daya was perceived by CS16 as obvious.

However, he could not clearly stipulate the extent to which the road infrastructure reconstruction had benefited the affected community in the district. This was particularly due to the relatively low destruction level that the tsunami caused to the local community. Nevertheless, he suggested that the reconstruction of road infrastructure in Aceh Barat Daya had provided the community with the better access. He revealed

> *"Regarding the benefit, obviously it was really beneficial. Regarding the community, whether there was economic improvement, it may need a further study since the impact of… the tsunami… was not so great here. However, the access has become better." – CS16*

The reconstruction of the road infrastructure resulted in more road reconstructed than destroyed. Regarding this, CS18 explained that rebuilding more roads than what was destroyed was among others caused by road networks interdependency. He further gave an example of road project near the border of Aceh with North Sumatra.

> *"For instance, the national road in Singkil which was built only up to the North Sumatra border. If it was only until the North Sumatra border, we designed the road to have 60km/hour average speed, but when it enters North Sumatra, it would get into the palm tree farms (gravel road). So it was extended by 10km (to reach the main road)." – CS18*

In addition to the road networks interdependency, he added that the reason why the reconstruction activity resulted in more road network rebuilt than destroyed was also due to the inaccuracy of the initial assessment, as well as due to the additional demands and requirements that came later in the implementation stage.

Additionally, CS16 also suggested that after the post-disaster reconstruction process the district roads had now had better surface condition. He said

> *"Of course we feel it (the improvement). Initially we had only gravel road, now we have hot mix. Shortly, that's the answer." – CS16*

CS16 further added

> *"Our first introduction to hot mix road, was the BRR project. Even though afterwards it was followed by (projects funded by) the special autonomy funds. In fact, now the district has started to (use) hot mix as well. Because the benefit… the design life can reach 10 years. CS16*

CS16's view on the application of Hotmix for the district road was also supported by CS14. He said

> *"Obviously, prior to BRR we did not have a single meter of road with hot mix asphalt except the national roads. When BRR was here, since the policy was that road must use hot mix, we look for road section that needed hot mix pavement. Particularly roads providing access to the community." – CS14*

Furthermore, not only had the reconstruction of road infrastructure resulted in the better access and the better road surface condition, CS16 also suggested that the road reconstruction had resulted in the reduced travel time in the area. Comparing the pre-disaster and post-reconstruction condition, CS16 gave an illustration

> *"The difference is significant. If, for instance, we go that way, it used to be impassable, now it is passable. Areas that were impassable, required the use of rafts or other means, now they are passable. The travel time is also improved. Banda Aceh to here (Aceh Barat Daya) now (seems)… close." – CS16*

5.9.4.2 Socioeconomic condition

As previously suggested by CS16, the extent to which the road reconstruction had improved the socioeconomic condition of the community could not be clearly stipulated. However, the better road infrastructure condition; better access, better road condition, and reduced travel time, which would eventually result in the reduced road user cost could indicate the economic benefit to the area. Not only was the road reconstruction activity perceived to have largely contributed to the rapid recovery of the affected community, the general socioeconomic condition in Aceh was also seen to be better than the pre-tsunami condition. This view was suggested by CS18

"In general, it was successful. What is the proof? The proof is that it (the reconstruction) recovers the condition of Acehnese people better than before the tsunami. We cannot deny it. Obviously successful." – CS18

Furthermore, from the interviews with the Aceh Barat Daya representatives, the local governments' personnel also felt the positive impact of being involved in the reconstruction towards their personal development. As stated by CS14

"Thank God it was very helpful. Regarding our livelihood… because, from the salary aspect, the BRR was obviously better. Maybe because they used international standard. Meanwhile the standard in the district is very low. From this aspect, I have to show my gratitude. I was trusted, and I got a good return from the trust. Wealth." – CS14

The road reconstruction was also suggested by CS17 to have provided positive impacts on the tourism sector. As CS17 said

"Regarding tourism, people have started to come… Particularly those who used to work (in Aceh reconstruction) like me, return to Aceh to see the beauty of our works. To me, if I had money, I would take my family to Aceh." – CS17

5.9.4.3 Improved capacity

Supporting the CS14's view on the impact of being involved in the road reconstruction to the personnel's wealth, CS16 also argued that the reconstruction process had also provided them the opportunity to improve their capacity. As described by CS16, the different background of those involved in the reconstruction gave him the opportunity to learn from his colleagues. CS16 said

"We had so much experience. From the technical aspect, we now know more… the BRR had better personnel. The BRR personnel was not only local people, but also from the central (government), so the knowledge was better" – CS16

Focused on the road sector, CS16 further detailed the skills he had learned from being involved in the process.

"In the road sector, it was the implementation system. The administration management system was different. It was easier for us to use. The presentation of graphs and figures

was also better… easier for us to check where the location was, how much the volume was." – CS16

CS14 further gave an example of how he had learned to construct Hotmix pavement, which was not known by the district personnel prior to the post-disaster reconstruction process. He stressed

"Here, there was no one who understands the hot mix (pavement type), but because of the BRR, me and my team can all learn about it. Also, the consultants that were sent to us were generally good, either by knowledge or experience." – CS14

This section has presented the analysis of the post-disaster road reconstruction success indicator as perceived by the respondents of the case study three. The cognitive map of the analysis is presented in Figure 5.40

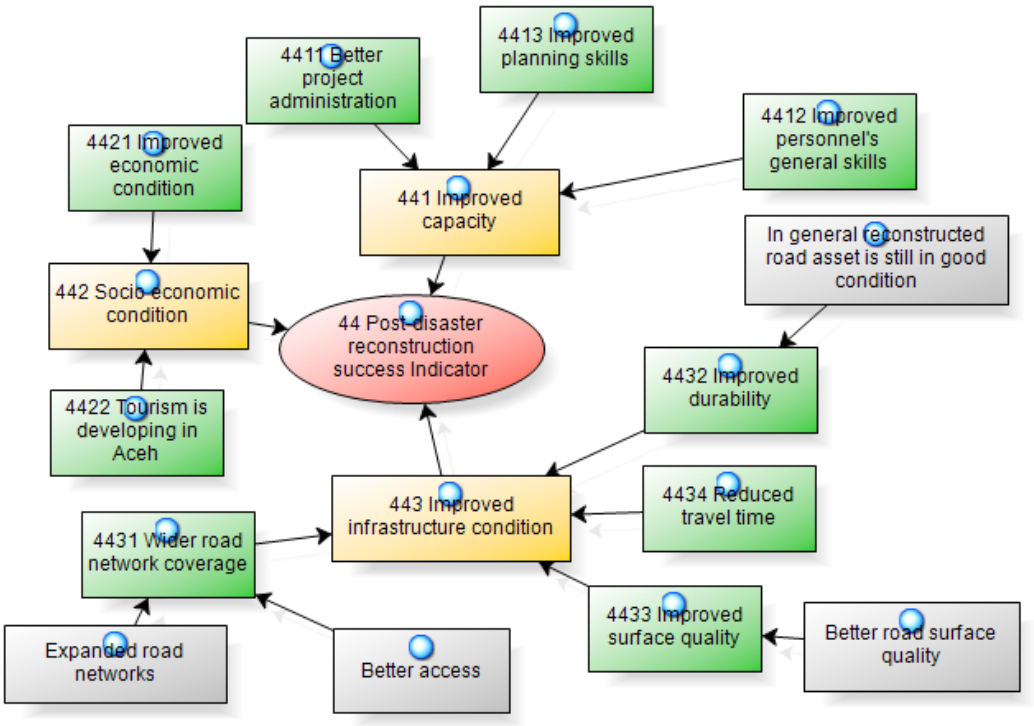


Figure 5.40 – Cognitive map of the post-disaster road reconstruction success indicator of the case study three

5.10 Link and summary

The above sections have presented the analysis of the various issues in the case studies. At this stage, each of the case studies has been analysed in separate sections. The analysis covers the various issues regarding the factors affecting the local government road maintenance capacity, followed by the maintenance strategy, the capacity building in road maintenance and the post-disaster road reconstruction success indicator as they are perceived by the respondents. Furthermore, the following section will accordingly present a cross case analysis of the three case studies. The results of the case study analyses will be compared and contrasted across the cases.

SECTION C – THE CROSS CASE ANALYSIS

This section presents the cross-case analysis of the data captured from the semi-structured interviews with a number of respondents from the three case studies. Being a cross-case analysis, the responses from the respondents will be compared and contrasted across the case studies. Accordingly, the similarities and differences between the case study districts can be identified. However, it is worth noting that the responses of the analysis were collected using a semi-structured interview method. By using the semi-structured approach, the interviewees were not presented with an identical list of questions. Rather, a list of themes and questions to be covered were used as the interview guideline which may also vary between interviews. Additionally, since the study adopts a qualitative approach, the analysis is not merely focused on the frequency that a particular case is mentioned in the interviews, but is rather more focused on the justification and the rationale behind each response. Therefore, the numbers of the respondents shown in the cross case analysis matrices indicate the relevance of the issues in the particular case study instead of their importance.

5.10.1 Maintenance capacity

The first category of the cross case analysis is with regards to the road maintenance capacity. The presentation and discussion of the maintenance capacity are ordered based on their relevance to the road maintenance issues. Accordingly, the section will start with analysing the external measures, followed by the internal aspects which are further divided into two main sub-categories, the institutional and the technical factors.

5.10.1.1 External factors

The external factors affecting the local government road maintenance capacity are those which are beyond the direct control of the road authorities, but somehow constrain and affect the road maintenance performance. The external factors therefore include the environmental condition, legal and regulatory arrangement, political and socioeconomic condition, safety and security, and the inter-organisational relationship between the various government and private institutions involved in the road management.

Summarising the analysis of each of the case studies as discussed in the previous section, the various external factors affecting the road maintenance capacity of each local governments are presented in Table 5.21. The national and provincial perspectives are also presented as a measure to compare and contrast the experience of the case study districts with the general views of the respondents at the national and the provincial level. The numbers in the table represent the number of interviewees citing the respective issues during the interviews.

Table 5.21 – External factors

External factors	*Aceh Besar*	*Aceh Jaya*	*Aceh Barat Daya*
111 Environmental	***3***	***-***	***1***
112 Legal and regulatory	***-***	***-***	***-***
113 Political	***3***	***3***	***5***
114 Socioeconomic	***5***	***4***	***3***
115 Safety and Security	***5***	***2***	***2***
116 Inter-organisational relationship	***2***	***1***	***1***

As shown in Table 5.21, most of the external factors affecting the road maintenance capacity appear to be experienced in every district of the study, with the exception of the legal and regulatory aspect. The issue of legal and regulatory impacts on the road maintenance emerged only in the discussion with the respondents at the national level as presented in Section A of this chapter. It appeared that the respondent at the national level were more familiar with the impacts of the legal and regulatory arrangement to the assets management, which became a major problem in the asset transfer process and the provision of budget allocation for the road maintenance.

5.10.1.2 Institutional factors

The cross case analysis of the external factors, factors which are out of the direct control of the road authorities, have been discussed in the above section. The internal factors, however, are divided into two categories, the institutional factors and the technical factors. The institutional factors refer to the organisational and managerial arrangement of the road authorities and the

likes, whilst the technical factors refer to the capability of the road authorities to perform the physical and engineering tasks (Robinson et al., 1998). The various institutional factors affecting the capacity of the local governments in road maintenance are summarised in Table 5.22.

Table 5.22 – Institutional factors

Institutional factors	*Aceh Besar*	*Aceh Jaya*	*Aceh Barat Daya*
121 Financial Management	***6***	***4***	***4***
122 Human resources	***5***	***3***	***3***
123 Organisational management	***3***	***4***	***3***

From the summary of the cross-case analysis as presented in Table 5.22, all of the three main institutional aspects of the road maintenance; financial management, human resources, and organisational management, appear to be experienced in all of the case-study districts.

In addition to the above issues, the financial management problems were also caused by the shortened budget use period. As shown in Table 5.23, the approval of the annual budget frequently experience delays. As a result, the remaining period for expending the budget significantly shortened as the budget would expire by the end of the year, regardless the approval dates. Additionally, delays in budget approval also resulted in the postponement of development project schedule. With regards to road projects, this condition often led to projects having to be delivered in the rainy season.

Furthermore, there was also an issue with the rate of budget expenditure. The average budget realisation ratio in the three case study district between 2006 and 2012 is shown in Table. As shown in the table, the average budget realisation ratio of the case study districts is 91.48%, representing an average annual unspent allocation of more than Rp 41 billion per case study district.

Table 5.23 - Budget approval date of the case study district

Financial Year	Aceh Besar	Aceh Jaya	Aceh Barat Daya
2005	June 13th 2005	June 3rd 2005	July 20th 2005
2006	May 1st 2006	July 7th 2006	June 19th 2006
2007	April 12th 2007	March 27th 2007	May 5th 2007
2008	April 8th 2008	May 14th 2008	April 1st 2008
2009	–	–	–
2010	–	April 5th 2010	Jan 28th 2010
2011	–	April 2011	–
2012	–	April 2012	–
2013	–	May 2013	Feb 8th 2013
2014	–	Jan 10th 2014	Jan 23rd 2014

Source: GoA and Syiah Kuala University as cited in World Bank (2008) and Public Works
Note: " – " data not available

Table 5.24 – Unspent budget allocation of the Case Study Districts (x Rp 1 billion)

Year	Kab. Aceh Besar		Kab. Aceh Jaya		Kab. Aceh Barat Daya		National Average
	Unspent budget	Spending Ratio	Unspent budget	Spending Ratio	Unspent budget	Spending Ratio	
2006	Rp 0.04	99.99%	Rp 7.63	94.75%	Rp - 4.40	101.64%	94.30%
2007	Rp 48.38	91.14%	Rp 203.73	59.07%	Rp 23.56	92.95%	89.57%
2008	Rp 58.04	90.37%	Rp 114.14	76.92%	Rp 6.72	98.06%	88.47%
2009	Rp 68.18	88.56%	Rp - 51.34	116.17%	Rp 7.69	97.52%	90.95%
2010	Rp 56.65	90.95%	Rp 30.89	92.65%	Rp 19.15	94.48%	91.03%
2011	Rp 28.03	96.07%	Rp 44.31	90.32%	Rp 49.18	88.66%	91.03%
2012	Rp 64.73	92.15%	Rp 66.86	85.95%	Rp 26.60	95.14%	89.49%
2013	Rp 134.15	86.56%	Rp 72.37	87%	Rp 57.75	90.07%	97.88%
Average	Rp 57.27	91.97%	Rp 61.07	87.82%	Rp 23.28	94.81%	91.59%

Source: Analysed from raw data Provided by DJPK (2014)

The average spending ratio of the case study districts are indicated in

Table 5.24, and compared with the national average of the district budget spending ratio. The red numbers indicate the spending ratio which are under the national average ratio and the blue numbers indicate spending ratio exceeding the budget availability (spending ratio of more

than 100%). As shown in the table, on average, all case study districts underspent their annual budget allocation. Among the three case study districts, the district of Aceh Jaya has the lowest budget expending ratio, with an average of Rp 61 billion of unspent budget allocation.

Having presented the cross case analysis of the institutional factors, the following section will accordingly present the cross case analysis of the technical affecting factors.

5.10.1.3 Technical factors

The third category of the factors affecting the road maintenance capacity is the technical factors. Three subcategories were identified from the data analysis, namely road design, traffic loading control, and plant and equipment issue. The technical factors of the road maintenance capacity are summarised in Table 5.25

Table 5.25 – Technical Factors

Technical Factors	*Aceh Besar*	*Aceh Jaya*	*Aceh Barat Daya*
131 Road design	***1***	***3***	***3***
132 Traffic loading control	***1***	***1***	***1***
133 Plant and equipment	***1***	***1***	***-***

As summarised in Table 5.25, the technical factors are in general perceived similarly in all of the study cases. With regards to the road design, the issue was mainly with regard to the use of Hot Mix Asphalt (HMA) surface type as it was widely used in the post-disaster reconstruction. The use of HMA for the local roads was introduced in the case studies during the post-disaster reconstruction. Accordingly, the benefit of using the HMA (better durability), as well as the financial consequences of adopting the HMA (more expensive), was perceived to have a greater contribution to the road maintenance efforts in the district.

Additionally, the issue of the availability and quality of the supporting plant and equipment for performing the road maintenance tasks appeared to be an issue in Aceh Besar and Aceh Jaya. In both districts, complaints were made regarding the lack of sufficient budget allocation for

the procurement and the maintenance of equipment and tools required for the road maintenance.

5.10.2 Maintenance strategy

This section discusses the maintenance strategy adopted by the case study districts. From the cross case analysis, the different maintenance strategies adopted by the local governments were identified. The strategies include preventive, neglect, reduced quality, and contractor's voluntary contribution. The summary of the cross-case analysis of the maintenance needs is presented in Table 5.26.

Table 5.26 – Responses to the road maintenance needs

Response to Maintenance Needs	*Aceh Besar*	*Aceh Jaya*	*Aceh Barat Daya*
221 Preventive	***1***	***2***	***2***
222 Neglect	***2***	***3***	***3***
223 Reduced quality	***1***	***-***	***-***
224 Contractors' voluntary contribution	***-***	***-***	***2***

As shown in Table 5.26, neglecting and abandoning the road infrastructure after the construction appeared to be the general 'strategy' adopted by case study district. The preventive action of the maintenance need was suggested by the respondents in the form of road maintenance MoU between the BRR and the local governments, expressing the willingness and acceptance of the local government beneficiaries to provide the maintenance allocation for the reconstructed road assets. In addition to the MoU, the adoption of the higher road design standard, the Hotmix design, was also perceived as a preventive action to prolong the road maintenance needs as the design was expected to be more durable than the previous road standard.

In addition to the above strategies, two approaches seemed to be unique and were adopted by different districts. The 'reduced quality' strategy was a response identified only in Aceh Besar. The argument was that due to the limited budget allocation, road sections requiring

rehabilitation were given routine maintenance. Even though the impact and benefit was admitted to be negligible, the strategy was adopted to keep the road accessible. In the other district, Aceh Barat Daya adopted the 'contractor's voluntary contribution' approach. The approach, which was done by asking the contractors working in a nearby area to repair the road damages, was adopted by the Local Government of Aceh Barat Daya due to the limited budget allocation for road maintenance, as well as due to the small value of road maintenance works to be delivered as a separate project.

5.10.3 Capacity building in road maintenance

5.10.3.1 Capacity building challenges

The capacity building efforts in the cases study districts regarding the road maintenance experienced a number of challenges. The summary of the cross-case analysis of the capacity building challenges is presented in Table 5.27. As shown in Table 5.27, the low political interest in the capacity building program was identified in Aceh Jaya and Aceh Barat Daya. In both districts, the local governments were suggested to have put a higher preference on the physical construction activities than the capacity building, since such a program was not seen to yield immediate benefits.

The quality and availability of personnel were seen as a challenge in the capacity building effort in Aceh Besar and Aceh Barat Daya districts. In Aceh Besar, the limited number of personnel with engineering background in the public works was worsened by the fact that the personnel with the engineering background was assigned to other non-engineering agencies. In Aceh Barat Daya, on the other hand, the lack of personnel with urban planning skills was worsened by the poor quality of the local consultants, which one of the respondents in Aceh Barat Daya claimed that the public works personnel frequently needed to tell and taught the local consultant what to do.

Additionally, the respondents in all three case studies also suggested that the existing capacity building programs were either poorly designed or insufficient for the personnel's needs. The Aceh Besar respondent complained that the existing trainings and workshops were generally delivered in short courses. He argued that it was impossible to gain the benefit from such short courses, particularly when the training or workshop was about complicated subjects such as

road and bridge design. As a result, he further suggested that the personnel mostly learnt from the informal interactions with the more senior personnel. In Aceh Jaya, the respondent added that there had been no capacity building program delivered at the district aiming at improving the budgeting capacity. As in Aceh Barat Daya, the respondent revealed that the lack of capacity building programs in the districts had resulted in the local personnel having to look for assistance from the external sources.

Table 5.27 – Capacity building challenges

Capacity Building Challenges	*Aceh Besar*	*Aceh Jaya*	*Aceh Barat Daya*
331 Low political interests	***-***	***2***	***2***
332 Personnel issues	***2***	***-***	***3***
333 Poor CB program	***3***	***1***	***2***
334 Limited budget allocation	***-***	***2***	***-***

The local government appeared to have low interest in the capacity building programs, apart from the subjects which were considered as urgent needs, such as the medical. Finally, in Aceh Jaya, the limited budget allocation for the capacity building activities had resulted in invitations and calls for trainings and workshop being turned away. Even though most of the trainings were free, the district did not even have the budget to pay for the travel and accommodation for the personnel attending the trainings.

The next section will present the cross-case analysis regarding the post-disaster road reconstruction success indicators as they are perceived by the respondents in the case studies.

5.10.4 Post-disaster road reconstruction success indicator

In the interview, the respondents were asked whether the post-disaster road infrastructure reconstruction in Aceh was considered successful. The respondents were later asked to justify their responses and accordingly provide the success indicators. The summary of their response was recorded and is presented in Table 5.28. Accordingly, this section will elaborate the success

indicators of the post-disaster road infrastructure reconstruction as perceived by the respondents.

As shown in Table 5.28, the success indicators of the post-disaster road infrastructure reconstruction can be grouped into four major categories. The four categories are disaster recovery, socioeconomic condition, improved infrastructure condition, and the improved capacity of the local government personnel. From the disaster recovery aspect, the respondents suggested that the disaster affected areas had recovered from the disaster impact. Additionally, the recovery was also considered to be achieved in a relatively short period, and with budget expenditure less than the original estimates and the budget allocation. These views were raised by the respondents from Aceh Jaya.

Table 5.28 – Post-disaster Road Reconstruction Success Indicator

Road Reconstruction Success Indicators	*Aceh Besar*	*Aceh Jaya*	*Aceh Barat Daya*
441 Disaster recovery	***-***	***2***	***-***
442 Socioeconomic conditions	***1***	***3***	***3***
443 Improved infrastructure condition	***1***	***2***	***3***
444 Improved capacity	***1***	***-***	***2***

In the next category, the socioeconomic condition of the affected areas was also seen as indicators of the road reconstruction success. The economic condition of the affected areas was seen to be improved, compared to the pre-disaster condition. This was suggested by the respondents from all the case studies. Other indicators include the better flow of goods and people in the affected areas and the development of tourism sector in Aceh. From the road infrastructure perspective, there appeared to be a consensus among the respondents that the post-disaster road infrastructure reconstructions have resulted in improved road infrastructure condition. This can be seen from the wider coverage of the road network, the improved durability of the road pavement, the better surface quality, and the reduced travel time.

In the last category, the respondents from Aceh Besar and Aceh Barat Daya suggested that the reconstruction of the road infrastructure in their districts had helped them improve their

capacity. In Aceh Besar and Aceh Barat Daya, the road reconstruction activity was believed to have generally improved the personnel's skills, with particular reference was addressed at the personnel planning skills. Additionally, the respondent in Aceh Barat Daya also added that being involved in the reconstruction had helped them better organise the project administration.

5.10.5 Links and summary

In this section, the cross case analysis of the semi-structured interviews with the respondents from the three case study districts; Aceh Besar, Aceh Jaya, and Aceh Barat Daya have been presented and discussed in detail. When applicable, the responses from the different respondents have been compared and contrasted to provide an insight into the similarities and differences between the case study districts. Since the study adopts a qualitative approach, the analysis is not merely focused on the frequency that a particular case is mentioned in the interviews, but is rather more focused on the justification and the rationale behind each response. Therefore, the numbers of the respondents shown in the cross case analysis tables above are used to indicate the relevance of the issue to the particular districts.

Having presented the analysis of the case studies, the following section will present the analysis of the expert semi-structured interviews. The expert semi-structured interviews were used as a method to triangulate the main findings and to validate whether the main findings represent the actual conditions.

SECTION D – THE EXPERT VALIDATION SEMI-STRUCTURE INTERVIEWS

This section is dedicated to presenting the result of the expert interviews, which was conducted as a method to validate the research findings. Accordingly, five respondents were asked their views on the research findings. The basic profiles of the expert respondents are presented in Table 5.29.

Table 5.29 – Respondents of Validation Interview

No	*Respondents' code*	*Main Professional Background*
1	***Val01***	***Academic***
2	***Val02***	***International Consultant***
3	***Val03***	***Consultant***
4	***Val04***	***Academic***
5	***Val05***	***International Consultant***

The interviews were conducted using semi-structured interview approach. The interview questions were with regards to the key research findings, which were grouped into four main categories; the general responses of the local governments towards the road maintenance, the main factors affecting the local governments' performance on the road maintenance, the post-disaster reconstruction process, and the safety and security issue in the post-conflict area. The interview guidelines are available in Appendix D.

5.11 Local Governments' general responses towards road maintenance

The key findings on the general responses of the local governments towards the road maintenance were that maintaining roads had not been a culture within the road authorities at the local level. Road networks were neglected from the routine and periodic maintenance immediately after they were built, and repaired only when the level of damages was considered significant and that the value of intervention works were worth working for. All respondents agreed on this issue as being a general attitude of the local governments, even though suggesting that there have been cases where local governments paid high attention to this

matter. Interviewee Val03 suggested this condition was mainly affected by the lack of consequences to the local governments who failed to maintain their roads. Val02 further added that local governments tend to spend their road maintenance budget on the easy-to-arrange maintenance interventions; such grass cuttings, but do not do the important parts such as keeping the drains clear. Val01 argued that the small value of road maintenance works was also part of the reasons that road maintenance needs being abandoned until the level of damage is significant enough and is considered to be worth working for. Adding to that, Val03 suggested that the academic world also contributed to this problem by undermining the importance and needs to generate good road maintenance engineers, proven by the lack of courses on the road maintenance subjects in the universities.

From the international perspective, Val04 added that a similar condition was also found in Sri Lanka as the local governments' response to the road maintenance needs was rather responsive based on the complaints from the community. With regards to the road maintenance strategy, he further suggested that the local governments need to assess the benefit and cost ratio of each maintenance strategy they opt to adopt, even if it was to abandon and neglect the road maintenance. Furthermore, whilst agreeing to the general attitude of the local governments, Val05 raised the need to carefully observe the reasons behind such condition, as the purpose and aim of the research has been set for.

5.12 The main factors affecting the local governments' road maintenance performance

5.12.1 Local political condition

From the political perspective, the respondents agreed that the high level of political intervention in the planning and budgeting process greatly affected the development priority. The local governments tend to accommodate the pressures posed by the parliament onto them. Val01 argued that this condition was mainly caused by the fact that the head of the government election campaign are commonly supported by the businessman and the political parties. In return, the businessman supporting the campaign would accordingly be paid back in the form of development projects, and that the political parties would have the pressuring

power to direct and divert the development planning and budgeting proposal for their advantage.

Additionally, Val03 suggested that the lack of consequence for failing to maintain the road infrastructure, and the high political incentive gained from building new roads were considered as the main drivers for the annual budget being channelled towards the capital projects. From the decentralisation point of view, Val02 argued that the high level of detail and control that the parliament has and can impose over the budget proposal prepared by the local governments resulted in the budget being diverted towards what the parliament thinks would be the most impressive investment in their district. Val04 further added that a similar case was also experienced in Sri Lanka. He argued that when politicians are given authorities over the budget, they would utilise it based on their political agenda and political opportunities. He added that this condition was also experienced in developed countries like the UK, even though in a more constrained way as the budgeting process is more transparent and accountable.

With regards to the issue of fairness and equality in dispersing the road project and expanding the road networks, Val02 referred to this issue as a problem experienced at all levels of the government. He suggested that the appropriation of budget to a reasonably even spread has produced an inefficient budget and the absence of prioritised expenditure. Additionally, Val03 also suggested that the local governments lack the understanding of the important features that road infrastructure offers, the accessibility and mobility. He further elaborated that even though the need for access have to be provided to the community, the mobility aspect should actually be used to help the local government decide the road maintenance priority, which could be done by putting into account the level of traffic in the particular area.

5.12.2 Conflict of authorities

Another finding emerging from the research is with regards to the conflict of authorities between the governments agencies involved in the road management. The department of public works and the department of transportation have been the two government agencies frequently in disputes regarding road deterioration problems. The department of public works was frequently accused of providing poor quality road infrastructure, whilst the department of transportation was also accused of allowing overloading vehicles to pass through.

All respondents agreed that both agencies were contributing to the road deterioration problem. Val04 described that the 'blaming culture' between government institutions involved in the road management was quite common. Val05 added that such condition may be affected by the lack of training and assessment to properly estimate the traffic. However, Val02 described that this problem was actually rooted to the fact that the axle load limit had been set to a very low level, which was "below the reasonably economic level for the operational of most of the networks." Accordingly, there had been too much incentive for the operator to break the axle load limitation. This condition was exacerbated by the very low capability of the department of transportation to control the limit, and the high level of corruption and abuse of any control system by both the operator and the community. Val02 further argued that if the axle load limit is set to an unreasonably low standard, people will abuse it regardless of the reasons (please refer to section 6.3.2.3 regarding economic consideration). He also referred to this problem as a "self-reinforcing negative cycle" as the cost to rebuild the damaged low standard road would be much higher than the cost to build the road to the sufficient standard in the first place.

5.12.3 Financial capacity

The findings of the research suggest that there are four financial issues identified in the case study districts; fund is not allocated in sufficient amount, allocated fund is not spend, fund is not spent effectively, and that the fund is not spent efficiently.

For the first issue, insufficient road maintenance allocation, all respondents agreed with this finding. Val01 suggested that the fund for road maintenance was deliberately allocated in insufficient amount, as the focus was placed on the capital projects which attract more political benefits. Val02 argued that this problem was also due to the high backlog of maintenance built-up as a consequence of the lack of proper road maintenance system.

Regarding the unspent allocation, Val01 was unconvinced that the local road authorities were not able to spend the budget allocated to them. However, at the district level this was in fact true in the case study districts that the annual budget allocation had rarely been exhausted. Val05 argued that this condition is affected by the poor commitment of the LGs in preparing good budget proposal and in spending them accordingly. However, as described by Val02, the

unspent allocation problem is rooted in the budget expending mechanism which was treated strictly within the annual budget cycle. As described in section 2.5.5.1.3, the delays in the budget approval resulted in the shortened budget expenses period. Accordingly, Val02 recommended that by utilising forward-planning and the budget envelope assurance model, the procurement and the award of the projects for the following year may commence before the annual budget cycle start. This way, the time wasted in waiting for the budget proposal and approval process may greatly be reduced. Adding to the above comments, Val03 added that the requests from the local governments to increase the budget allocation for the road maintenance had been previously rejected by the MoF due to the fact that on average annually the local governments in Indonesia had more than Rp 100 trillion of the total annual budget unused.

From the effectiveness point of view, Val01 stated that the ineffective budget expenditure was mainly due to the improper response to the road deterioration problem. Val03 corroborated this statement by saying that the ineffective expenditure was because the local governments tend to spread the available maintenance budget too thin over the road networks requiring intervention. Accordingly, he argued that "instead of concentrating… on certain points and do it properly, they spread it over the whole length."

Furthermore, in accordance with the research finding which suggests that a large proportion of budget allocation was inefficiently spent for routine expenditure, such as salary and travel expenses, Val01 agreed that the government agencies tend to spend a significant amount of fund for the travel expenses, which were often considered to be unnecessary. Accordingly, Val04 confirmed his view on the financial issues and stated that there was a conflicting situation between the first condition - fund insufficiency, and the remaining three factors - unspent budget and ineffective and inefficient expenses. He added that this was affected by the bureaucratic process in the governments which have a quite restricted budget expenditure mechanism where certain funds could only be channelled to certain types of works. As a result, there would be areas which have leftover expenses, whereby other areas at the same time were suffering from fund insufficiency.

5.12.4 Human resources

With regards to the accountability issue, where the problem of unreliable road information system being accused as the cause of the road maintenance neglect by the political leaders, Val03 illustrated this problem as the chicken-and-egg problem, referring to which one exists in the first place and initiates the problem. Respondent Val03 and Val05 further recommended that there was a need to bridge the gap of communication between the road authorities and the politicians using terms understood by both parties. Val05 specifically suggest that using financial terms might provide better impacts to the politicians. They also suggested that the gap could be reduced if the road authorities were able to present a different set of scenarios or alternatives which describe the impacts and consequences for choosing or not choosing them.

In addition to that, Val02 further argued that the problem also rooted in the poor enforcement of the use of the data to the road maintenance budgeting plan. He further underlined that the information system itself was part of the problem as the interpretation of the simple parameters obtained from the observation of the road condition was very indirect. As an example, he contended that the road roughness data does not provide a clear link to what kind of responses and how much money would then be required, as much as how drainage condition could affect the road deterioration problem.

From the capacity building point of view, all respondents agreed that there was little interest in the capacity building program. Val01 argued that the capacity building programs were often delivered ineffectively and considered merely as activities that need to be delivered, with little interest in the outcomes. Additionally, Val03 indicated that training programs were frequently used as a means to get some extra income through the provision of the travel allowances, and also as 'vacation' opportunities. Regarding this issue, Val02 added that the ineffective capacity building problem was due to the very shallow concept of the capacity building in the first place. He further added that the capacity building problem required a complete change of understanding of what the systematic approach is, the required tools, and then the training of the people to specifically do that, rather than to go for a general study and training. Supporting this argument, Val05 warned that such an effort requires changing of attitude, which was difficult to implement and would require medium to long term process.

With regards to the skilled personnel shortage and inappropriate personnel educational background in the local road authorities, all respondents also agreed with the findings. As one of the causes of the problems, Val01 added that at the local level, there were many unqualified honorary and *pre-arranged* personnel. The *pre-arranged* personnel stipulated by Val01 referred to the personnel who got the job through a political endorsement. Added to this argument, Val02 and Val03 supported that there were many cases at the district level where certain posts were filled with inappropriate or low capacity personnel due to the promotional opportunity and the Bupati's request. Val04 also implied that such condition was also experienced in Sri Lanka as a result of the improper recruitment process and the political interference in the appointment of personnel at the strategic places, where the expertise had not been necessarily ensured. Consequently, there might also be local experts being prevented to come to the surface by the local politics. Balancing the view, however, Val02 added that if high skilled engineers were required for every engineering position in the road authority, there would always be a shortage of engineers. Accordingly, he suggested to have two divisions of path; path where personnel with lower qualification can be trained to manage the work in every way, and the path where the engineer can concentrate on the jobs that do require engineering input such as road upgrade and drainage system.

5.13 Post-disaster reconstruction process

5.13.1 Asset transfer issues

As discussed in section 5.4.2.3 regarding the asset transfer, the process of transferring reconstruction asset back to the local governments experienced a number of problems including rejection and delays, which resulted in maintenance neglect. The research findings suggest that the asset transfer problems had resulted in the reconstruction assets being neglected from maintenance and that the reconstruction assets would therefore need to be transferred back to the local governments immediately after their completion. The research also recommends avoiding assets change of ownership in the post-disaster reconstruction activities and the necessity to establish a clear set of rules and regulations regarding reconstruction assets prior to the commencement of the project, and even prior to the disaster.

Various responses were suggested by the respondents regarding the asset transfer issue. As raised by Val03, “no other region, except in Aceh during the tsunami reconstruction by the BRR that road ownership status changed from the national assets down to be the district assets. Only in Aceh.” Additionally, Val01 could not comment on this matter apart from his experience on the normal road construction procedure where roads should actually be handed-over by the contractor to the respective governments immediately after the project completion. Adding to that, Val04 suggested that the reconstruction of the infrastructure in Sri Lanka was not that complicated and rigid. He explained that the national government acted on behalf of the local governments as part of the reconstruction process. Therefore there had been no asset transfer issues in the post-disaster reconstruction in Sri Lanka.

Furthermore, Val02 and Val04 confirmed their support on this view and stated that there need to be an agreement between the parties before the project started. However, Val04 warned that such process may lead to delays and argumentations between the parties. One way to avoid delays and argumentation is therefore to have the rules and regulations established well in advance, as suggested by Val02. Val02 added that for an asset to be transferred back to the local governments immediately after its completion, a definite set of rules and regulatory arrangements was required. Such regulation would need to exist before a disaster occurs, and the agreement from the local government to maintain the reconstruction asset would need to be in place before the project starts.

5.13.2 Considerations of road maintenance need

Three main arguments were suggested as the key research findings regarding the consideration of future road maintenance needs; future road maintenance needs was not-well accounted for in the reconstruction process, the MoU for the road maintenance was not effective to ensure that the roads were maintained, and the selection of HMA as the standard pavement had turned it as a new road pavement standard. The latter eventually led to the local governments to ignore the economic benefit of the different types of road surfaces.

Val01 raised his doubt that the future road maintenance was well-considered in the disaster reconstruction process and said that “I think road maintenance needs was not accounted for as the reconstruction activity did not seem to be that well-structured and detailed to that level.”

Adding to that, Val03 suggested that donor agencies normally expect that the road maintenance to be the responsibility of the benefiting local governments. Confirming the above statement, Val02 underlined that at the beginning of the reconstruction process in Aceh, the future maintenance needs had not been well-considered. It was only later in mid-2007 that the BRR realised that the future post-reconstruction problems need to be addressed. However, whilst most donors were aware and agreed on the potential problems, not many were able and willing to readjust their reconstruction program and their funding scheme to address the issues.

Furthermore, regarding the use of the maintenance MoU between the BRR and the local governments, Val02 agreed that it was ineffective to ensure that roads would be maintained. He added that the MoU was not sufficiently binding and that the BRR was a temporary agency. Furthermore, Val03 suggest that the MoU was not an effective solution to ensure roads would be maintained as there were no penalties for breaching it, and there were also the lack of incentives and motivations for the local governments to respect it.

Additionally, Val03 agreed that the Hot Mix Asphalt (HMA) had been uniformly and widely used in Aceh, disregard of the actual traffic volume of the particular network. Whilst on the one hand it was highlighted that high standard pavement was used as a means to prolong the maintenance needs, on the other hand Val03 underlined the political aspect that caused it. He argued that the reconstruction of Aceh involved a large number of donors, each of which was 'competing' in displaying the best products and outcomes. In the case of road infrastructure, as the HMA became a widely used pavement, donors were hesitant to use the 'inferior' pavement type. With regards to the impact to the local governments, Val02 suggested that the problems had been experienced widely in Indonesia. He argued that it was mainly because the local governments did not have enough knowledge about the most economic type, and that "they generally tend to think the one that is probably the easiest to maintain is the one to go for." He summed it by suggesting it as a natural preference since the local governments did not have a good road maintenance capacity. Adding to that, Val04 suspected that this condition occurred due to the lack of sufficient discussions, knowledge, and stakeholders' engagement in the process. He further added that the technical 'know-how' is an important element which is often overlooked, particularly in a circumstance such as the post-disaster reconstruction.

5.13.3 Involvement of the local governments in the post-disaster reconstruction process

With regards to the involvement of the local governments in the post-tsunami reconstruction in Aceh, the research identified that the post-disaster condition was a major constraint to the effective and efficient involvement of the local governments. All respondents agreed with these findings and acknowledged that involving the already devastated local governments in the reconstruction process was proven to be a major challenge. Comparing the east coast and the west coast area of Aceh, Val02 implied that the self-planning process in the east coast was much more successful than the west coast, as the west coast area was heavily devastated and had a substantially greater loss of capacity compared to the east coast area.

Adding to that, Val03 argued that there was a big gap of capacity between the BRR and the local governments. This condition in turn affected the involvement of the local governments in the process, and the transition from the disaster reconstruction to the normal development phase. Accordingly, Val04 highlighted the importance of local resiliency towards disaster. He argued that when the local governments are under pressure due to the impacts of the disaster, it would be difficult to get them involved in the reconstruction process. Accordingly, Val05 added that the fact that the Local Governments are victims of the disaster should not justify the exclusion of the LGs in the reconstruction process. Val04 further stressed that understanding the local situation carefully and contextualising the problem before applying the textbook answer would be the key to the reconstruction success.

5.14 Safety and security issues in the post-conflict area

5.14.1 Main safety and security issue

From the safety and security point of view, the research identifies three issues affecting the road reconstruction process in Aceh; the oppressive behaviour of the community and individuals, illegal extortion of 'security fee', and the relaxed supervision due to the safety threats to the construction supervision personnel.

Even though agree with the findings, all respondents suggested that these issues were not unique to Aceh. At various levels, the problems of project disruptions and security fee were admitted by all respondents as common problems experienced in road projects. Additionally,

with regards to the relaxed supervision due to safety threats, Val01 also argued that whilst this was very likely, most relaxed supervisions result from the collusion and corruption between those involved in the projects rather than due to threats. In Aceh, these problems were worsened by the post-conflict condition, where parts of the peace agreement were to provide work opportunities for the ex-combatant as part of the reintegration process. Accordingly, as described in section 5.7.1.1.3 regarding Safety and Security, the ex-combatant association – known as KPA, frequently put pressure to the contractors for the security fee, to works as the project labour, or as the project suppliers. Regarding this issue, Val05 argued that when the capacity exists, the local community should be given a chance to be involved in the reconstruction process. Whilst admitting that the process would be challenging, it would have better long-term impacts as it creates a better sense of ownership to the community.

Additionally, with regard to the post-conflict, Val04 referred to conflict as a highly context specific situation, as there are many variables involved. Consequently, he stressed that there would be no universal approach to address a post-conflict situation. In Sri Lanka, the conflict ended in 2008 after a series of military oppression, instead of peace negotiation such as what happened in Aceh. Accordingly, prior to 2008, Val04 described that the areas in conflict did not receive sufficient post-disaster intervention from the national government since people could not reach the affected areas and provide what was needed.

5.15 Summary and the links

This section provides an in-depth discussion on the responses from the experts in the road management and the road transportation subject regarding the findings of the research. Not only has the section elaborate the confirmation and refutation from the experts, it also covers the justification and explanation behind the respective phenomena. Accordingly, the research findings are found to be conforming to the views of the experts and are therefore considered to be valid.

The following chapter, is accordingly dedicated to presenting the research findings in more detail and will be further linked and associated with the literature. When appropriate, the findings will be compared and contrasted to the literature, in order to provide a more thorough understanding of the issues and as another means of finding validation.

Chapter - 6 RESEARCH FINDINGS

6.1 Introduction

In chapter 5, the data analysis of the semi-structured interviews with the high-level officials and policy makers, the case study analysis, the cross-case analysis and the expert validation semi-structured interviews have been presented and discussed in detail. The analysis and reviews from the experts on the key research findings have also been presented as a means of triangulation and validation of the research findings.

In this chapter, accordingly, the overall empirical research findings of this study will be compared and contrasted with the literature as a form of findings triangulation. The structure of this chapter will be arranged as follows.

- First, the general approach of the case study districts towards road maintenance needs will be discussed.
- Second, the main challenges and factors affecting the performance of the local governments in road maintenance are presented.
- Third, the local governments' capacity in the road maintenance is linked with the post-disaster reconstruction process. The discussion is expected to establish and propose a model for the post-disaster road infrastructure reconstruction.
- Lastly, the conceptual framework is refined and updated to reflect the findings of the research.

6.2 General responses to road maintenance

The detailed responses of the local governments of the case study districts towards road maintenance needs are presented in section, 5.7.2, 5.8.2, and 5.9.2. The analysis of the interviews suggests that the road infrastructure were generally neglected from maintenance. The routine and periodic maintenance activities were not regularly performed. The local governments of the case studies lacked the preventive maintenance culture and the general responses to preserve the road infrastructure were accordingly to repair the road when it was broken (refer to section 5.7.2, 5.8.2, and 5.9.2 of chapter 5 regarding the maintenance

strategy). This condition is in accordance with ADB (2003) report, which highlights that in the countries where road maintenance is not a culture, roads are repaired when they fail. Preventive maintenance is even considered to be a waste of resources, and the expensive remedy for premature rehabilitation is not linked back to the lack of regular maintenance.

In the case study districts, the newly rehabilitated or reconstructed road networks were abandoned from maintenance immediately after their completion. Road rehabilitation and reconstruction were perceived as the necessary repair interventions. Dirt and gravel roads were left to deteriorate until there were enough funds to upgrade the surface. Similarly, the paved roads were also neglected from maintenance interventions until the next rehabilitation works were considered necessary and the fund became available. Occasionally, the limited maintenance allocation was even used for periodic maintenance on roads requiring rehabilitation, which impacts would diminish in a short time. Harral and Faiz (1988), stipulate that two thirds of the pavement deterioration problems occur in the final third of the pavement design life. In the first two-third of the period, accordingly, road pavement may survive even without maintenance; after which road maintenance needs may surge dramatically. This is probably the reason why in the case study districts, road maintenance was generally delayed and ignored, until it was eventually too late to rectify the level of damages which had occurred.

To prolong the road life, hence the needs for the maintenance, the local governments opted to use the high specification pavement type (section 5.4.1.1.3.1). This option appeared to be reasonably justified, as the road deterioration rates are among others affected by the construction quality, material standard, design specification and proper craftsmanship (Kendrick, 2004), and the age of pavement. However, as identified by Karim (2011), road designers often ignore a very important aspect of the road management, which is the possibility to maintain the networks in the future. Consequently, instead of providing regular maintenance, gravel roads and macadam roads in the districts were being upgraded to hot mix asphalt (HMA) pavement. HMA was therefore widely used as the new standard for the district road construction and was perceived as the solution to extend the road serviceability period. In fact, despite their initial build quality, road pavements deteriorate over time. Road design life can only be achieved if roads are maintained, as it would keep the roads' level of serviceability and prolong the need for rehabilitation and reconstruction. ADB (2003) refers to

this problem as the road agency's poverty trap; building more roads or improving roads to the wrong standards; approving only asphalt road projects even though expensive to build; or failing to recognise that some roads are no longer maintainable and need to wait for reconstruction. Accordingly, as the higher road specification is more expensive to build, more financial resources are potentially wasted due to the lack of maintenance. Such conditions also ignore the necessity and the economic advantages of the different pavement types.

The result of the case study analysis and experts validation interviews corroborates this finding. Detailed elaboration on this issue for each of the case study is presented in section 5.7.2, 5.8.2, and 5.9.2 of chapter 5 regarding the maintenance strategy. The expert validation analysis on this issue is also covered in section 5.11. Nevertheless, this condition was affected by a number of reasons. Among other reasons, the local political condition, the conflict of authorities between the government agencies involved in the road maintenance, the poor financial capacity of the districts, and the poor capacity of the road authorities' personnel have been identified as the main challenges in the road maintenance. More discussion on these issues will be elaborated in the following section.

6.3 The main factors affecting the performance of the local government in road maintenance

The results of the data analysis suggest that the road maintenance problems in the case study districts can be grouped into the external, institutional and the technical factors. This is in accordance with Robinson et al. (1998) classification of road maintenance problems. From the external side, the road maintenance problems in the case study districts have been identified to include the environmental, legal and regulatory, political, socioeconomic, safety and security, and the inter-organisational relationship. From the internal side, the institutional factors include financial management, human resources, and organisational management. Accordingly, the technical factors of the road maintenance problems are road design, traffic loading controls, as well as the plant and equipment. After observing the level of significance of each of the affecting factors, as well as the interrelationship and the interdependencies between them, the research has identified that the local political condition, the conflict of

authorities, the financial capacity, and human resources are the most affecting factors to the local governments' road maintenance capacity.

6.3.1 Local political condition

The outcomes of the data analysis suggest that the local political condition, the socioeconomic conditions and the conflict of authorities between the government agencies involved in the road sectors were the most affecting external factors to the local governments' road maintenance performance. This was particularly due to the level of impacts and influence that these factors could affect the other factors. The impact of the socioeconomic condition will be discussed in section 6.3.2, whilst the issue of conflict of authorities will be discussed further in section 6.3.3.

The data analysis of the political factors affecting the capacity of the local government in the maintenance of the road infrastructure is presented in sections 5.7.1.1.2, 5.8.1.1.2, 5.9.1.1.2. The findings on the political aspect presented in this chapter are built around the three major aspects surrounding the political issue which include the political intervention on the development priority, the poor interest in the road maintenance, and the principle of wealth distribution.

6.3.1.1 Political intervention on the development priority

ADB (2003) identifies that the decision-making process in the developing countries tends to be intentionally subjective and political, based on consensus requiring discussion, committees and compromise. To a certain extent, this was in fact part of the purposes of the decentralised system in Indonesia, which was expected to be the instrument that encourages broader participations of the citizens and ultimately leads to increased efficiency and improved governance (Jütting et al., 2005). The decentralised system was then expected to provide the community with "much more independence in electing their own leaders, promoting their own interests, developing their own institutions, initiating their own policies, managing their own financial resources, and mobilizing support from their own communities" (Rasyid, 2004)

However, as highlighted by Ahmad and Mansoor (2002), the demand for decentralisation in Indonesia was not primarily driven by a perceived need to improve the local service delivery,

but more by a desire to have control over resources and the political and legal autonomy. Consequently, along with the decentralisation of authorities, the decentralisation process has been argued to be a process of 'decentralisation of the corruption, collusion and nepotism practices to the local level (Darmawan, 2008), which affect the executive, legislative and judicial branches of the government (Mahfud cited in Daslani, 2012).

As with the case study districts, the political pressure was experienced widely with regards to the decision making process. In particular, the budgeting authority of the parliament resulted in the political interference in the development programs prepared by the local governments and, in particular, the road maintenance planning. Consequently, since the parliament held the right to refuse the budget proposal, the local government tended to accommodate the parliament requests to ensure political stability is achieved, to avoid political disputes and delays in the budget approval process. Accordingly, whilst road maintenance activities received a small budget allocation, the limited road maintenance allocation would also need to be distributed in accordance with the political interest. Such pressure resulted in the budget proposal unnecessarily reflects the development plan prepared by the planners and that the approved maintenance budget allocation may not reflect the actual road maintenance needs.

6.3.1.2 High preference on road capital projects

As highlighted by ADB (2003) the value of the project, the relatively more sophisticated level of the work, and the immediate impact of a capital project is more politically and technically interesting for the politicians, as well as for the road engineers. Since the maintenance needs frequently get low priority, the final budget allocation often resulted in the postponement of maintenance works to the later year, due to the limited budget availability in the running year and the competition with other sectors.

Levik (2001) argues that in most countries, investing money in building new roads is more politically favourable. Road maintenance is less politically attractive when compared with new road construction, road rehabilitation, or social programmes which provide more 'visible' impacts and therefore offer greater political benefit (UNESCAP, 2005, Donnges et al., 2007). This confirms the findings from the case study districts. In the case study district, the political intervention did not only occur in the form of shifting development plan towards certain

development sectors, but also in determining the road project types and location. Building new roads and upgrading road surface were also found to be more preferable than the road maintenance as allocating budget for the road maintenance rarely attract political benefits. Donnges et al. (2007) also argue that such condition is particularly affected by the limited tenure of the politicians in their office.

Nevertheless, the poor maintenance budget distribution and allocation is not solely due to the political pressure. In the case study districts, the low political interest in the road maintenance was worsened by the fact that the road engineers and professionals also perceived road maintenance works as being inferior to road construction (section 5.10.2). According to Robinson and Stiedl (2001) such condition is one of the consequences resulting from a decentralised system, which erratically place responsibility for the road maintenance to the incompetent organisation. Additionally, as emphasised by Estache and Sinha (1994), decentralization tends to increase government expenditure on infrastructure, possibly due to different preferences on quality and quantity of infrastructure between national and regional government.

In accordance with the argument, the importance of the road maintenance was not well-perceived by the road authorities of the case study district. The relatively small value of the road maintenance projects was not seen as interesting areas by the engineers in the road authorities. Regarding this issue Donnges et al. (2007) add that the road maintenance does not seem to offer an interesting career path for the engineers. Such a preference, according to UNESCAP (2005), is one of the factors which complicate the efforts to raise sufficient maintenance funds and is also identified as one of the main constraints in the maintenance of road assets.

6.3.2 Socioeconomic condition

6.3.2.1 Distribution of wealth

As a response to the road maintenance problems, Heggie (2003) suggests that road need to be managed professionally and treated as a business. Practically, this suggests that the local governments should only build roads that can be maintained, and to maintain what have been built. This argument leads to the recommendation to establish independent road authorities

and the adoption of the road fund mechanism as a sustainable source of maintenance fund (De Richecour and Heggie, 1995, Potter, 1997, Zietlow and Bull, 1999), and the involvement of private companies in the operation or the ownership of road infrastructure (Carpenter et al., 2003, Ozbek and Jesus, 2007, IndII, 2010).

Nevertheless, the poor awareness on the road maintenance needs, and the high political interest in the construction of new roads in the case study district are also affected by the socioeconomic condition of the areas. Hence, adopting the rational approach of prioritising road maintenance over the equal distribution of access had not been well perceived in the case study districts. As highlighted by ADB (2003), in the developing countries, roads are regarded as an essential public service and therefore the rational economic decision-making rules may not be applied. Accordingly, the need to distribute wealth to the community in the case study districts was practically translated as the equal provision of access. The local governments were more focused on building new roads and upgrading gravel roads to asphalt pavement than the 'rational' approach of maintaining the existing roads and maximising the value of the investment (please refer to section 5.7.2, 5.8.2, and 5.9.2 of chapter 5 regarding the maintenance strategy).

Explaining such condition, Donnges et al. (2007) also add that the development of the rural road networks is vital to the development of the agricultural sector, which would lead to the economic improvement of the area. This was also the view perceived by the local governments who saw that limiting the road networks to the maintainable scale may restrict the potential economic growth. Additionally, as the benefit was more immediately visible than what road maintenance could offer, the local governments put a higher interest on what the businesses and the industries may immediately contribute to the economic development of their areas. This was reflected by allowing the overloaded vehicles to keep operating in the district roads, despite the damages they caused to the road infrastructure.

However, even though Donnges et al. (2007) underline the importance of the impact of the rural road development to the economy, they further argued that two basic measures need to be in place in a decentralised road management system, namely the provision of basic

minimum of fund for the road maintenance and the adequate capacity to spend the fund effectively, which is quite challenging to the LGs as discussed in section 6.3.4.

6.3.2.2 Community's lack of sense of ownership

In addition to the issue of wealth distribution, the community was also argued to have lacked the sense of ownership to the road networks in their neighbourhoods. The community was argued to have frequently disturbed the projects in their area by proposing irrational requests. The irrational requests commonly took place in the form of forceful demands to work as the project labour, or as the supplier of the construction materials, which often came with higher unit prices. In another case, farmers were frequently dumped the waste from cleaning their rice paddy fields on the road shoulders, blocking the road drainage and intensifying the road deterioration rate.

Regarding the sense of ownership of individuals towards an organisation, Pierce et al. (2001) propose that psychological ownership emerges from three major routes; intimately know the target, controlling the target, and investing the self into the target. With regards to the road infrastructure, 'Intimately know the target' can be achieved through consultations and dissemination of project details to the stakeholders. 'Controlling the target', on the other hand, can be achieved by involving the stakeholders in the key decision making process. 'Investing the self into the target' is accordingly achieved by allowing the stakeholders to contribute to the capital cost of the project, or involved as the construction labour. Supporting the above view, by observing the rural water infrastructure development in Kenya, Marks and Davis (2012) propose a similar finding that the community members' sense of ownership can be stimulated by involving the community in the key decision making process, contributing towards the capital cost of the construction, participation in the planning and construction activities.

In the case studies, the aforementioned key components to stimulating the sense of ownership of the community had not always been existed. Being a disaster response, most reconstruction projects were funded by the government or donor agencies. Accordingly, creating the sense of ownership through the community contributions of the capital cost seemed to be irrelevant. Furthermore, recruiting the community as labour for the project was not always rational nor

practical. This was mainly because the community may not have the required skills to keep the project run in the required pace, and that road projects are packaged and tendered in a way that it would commonly span over a number of villages, which makes recruiting different personnel for different sections of the road project inappropriate.

On the other hand, the lack of community sense of ownership also appeared to be a result of the exclusive road reconstruction process. There was an example given where the traditional farmers in the rural areas destroyed the drainage channel along the roadside to make water inlets for their farms, as the new drainage channel did not provide water inlets to the farming areas (section 5.8.1.1.3). This condition suggests that there had been lacked of communication and stakeholders' involvement in the reconstruction process. The farmers' dependence on the drainage channel had not seemed to be accounted for or alternative sources of water were not introduced to the farmer in the road drainage rehabilitation design.

The above sections have presented the arguments on the social pressure to the distribution of wealth and the dilemma between dispersing development project due to the equality issue and working in accordance with the actual development priority. A discussion on the community's lack of sense of ownership was also argued to contribute to the rapid road deterioration. Accordingly, the following section will present the economic consideration that drives decision making process in the road management.

6.3.2.3 Economic consideration

In addition to the social pressure, the economic consideration also contributed to the road deterioration and the road maintenance capacity. One of the main causes of the road rapid deterioration is related to the structural bearing capacity, which is affected by the vehicle axle loading capacity (section 2.4.2.2). Road is structurally designed to cope with a certain vehicle axle loading capacity. In Indonesia, the vehicle maximum axle loading capacity allowed for class III roads, the lowest road class, is set to be at eight tons (Law, 2009a, article 19), even though in certain circumstance, the vehicle maximum axle loading capacity may be and frequently set to a lower limit; as low as three tons. Occasionally, this condition led to the confusion between the public works agency - as the agency which was responsible for the construction, and the transportation agency which was responsible to control and enforce the traffic loading capacity

limit (section 5.4.1.1.1.4). This condition frequently led to unsolved disputes between the two agencies (Bappeda Jatim, 2011, Dewi and Maris, 2014).

The West Coast area of Aceh province where Aceh Besar, Aceh Jaya, and Aceh Barat Daya are located, is mainly occupied by palm oil agricultural industry and the mining industry. As a result, trucks and other vehicles transporting the heavy loads accordingly would need to transport their products to the processing plants or ports through the district roads, before they reached the provincial or the national road. This activity consequently and greatly contributes to the rapid deterioration of the road networks, particularly when the roads were not structurally designed to cope with the heavy load.

On the one hand, the agricultural and mining industry is necessary to help improve the economic condition of the areas. On the other hand, however, ignoring the consequences the heavy loaded vehicles cause to the road infrastructure will result in the rapid road deterioration. In reality, the Local Governments tended to ignore this problem and was more focused on the direct income that the industry may provide to the district (section 5.7.1.1.3, 5.8.1.1.3, and 5.9.1.1.3). As a solution to this issue, it was argued that the Local Governments should be in charge and lead the process of enforcing the maximum axle loading capacity regulation. This is particularly due to the involvement of several institutions in the road management. However, enforcing traffic regulation is not only a matter of a dilemma between business investment and the damage to the road infrastructure. In fact, the issue of corruption in enforcing the vehicle loading capacity regulation seems to be a greater barrier in controlling the overloading traffic. More detail on the corruption issue will be discussed in the following section.

6.3.2.4 Corruption

The report of the Transparency International on the global corruption perception lists Indonesia as the 114 out of the 175 countries surveyed in the 2013 report (Transparency International, 2013). In the road sector, the transaction cost of the capital works can reach from 5 to 20 per cent due to corruption (World Bank, 2009b) and that every dollar's worth of stolen materials may lead to reduced returns to the project as much as $3.41 (Kenny, 2007a). The World Bank (2009b) also adds that the corruptions in the capital works are most obviously detected in the

process of selecting and awarding the contract in the form of bribes and kickbacks, bid rigging, and fraud.

Moreover, not only did corruption occur in the road construction phase, it was also experienced in the traffic loading control. The traffic loading control is particularly performed by operating the weighing stations. However, the traffic loading control initiative was spoilt by the corrupted operators. It was suggested that working as one of the weighing station operators has been one of the most favourite positions among the transportation agency's staff due to its corruptibility (please refer to section 5.4.1.1.1.3 on the corruption section for more detailed discussion). Regarding this issue, Shleifer and Vishny (1993) suggest that the practice of corruption spreads as a result of competition between both officials and the consumers. They further conclude that competition between officials to get a job trough 'auction' mechanism will assure that maximal bribes are collected.

In accordance with the above discussion, a joint report of the World Bank and BRR (World Bank and BRR, 2006b) reveals that there are four forms of illegal payment that truckers coming into and going out of Aceh province had to pay, namely,

1. Police and military post,
2. Weigh stations,
3. Convoy fees and
4. 'Facilitation' agencies.

The police and military post and convoy fees were less relevant to this study as they are mainly fees charged by police and military troops for truckers transporting goods without legal documents such as scrap metals and plastic. Also, after the peace agreement, the police and military post reduced quite significantly as a large number of troops were pulled-out of Aceh as part of the agreement, even though it eventually rose as the abandoned post were later occupied by the local police and military troops.

What are more relevant to this study are the illegal extortion collected by the weigh station operator and the 'facilitation' agencies. The report concludes that payments at the weigh stations have been the largest illegal charges for truck drivers. At the weigh station, truckers needed to commonly pay as much as Rp 20,000 (£1) per overweight ton. This practice

continued to occur regardless the Law no 22/2009 (Law, 2009a) article 307 which stipulates that overweight vehicles should be brought to court and may be imprisoned for a maximum period of 2 months or Rp 500,000 (£25) in fine. As expected, it was argued that none of the charges income went into the government treasury (World Bank and BRR, 2006b).

The 'facilitation' agency fee, on the other hand, are fees collected by mafia-like freight transporter organisations which provide reduced overweight charges for its members when they pass the weighing stations. A collusion between the organisations with the transportation agency personnel at the weighing stations had been arranged. While some agencies provide a fixed rate of Rp 50,000 – Rp 70,000 (£2.50 – £3.50) regardless the amount of overweight loads, some others offer a reduced rate of Rp 10,000 (£0.50) per overweight ton. Both models require monthly membership fees of around Rp 25,000 – Rp 50,000 (£1.25 – £2.50) and distribute the truckers with stickers to be attached in the front windshield that the weighing station personnel can immediately recognise.

6.3.3 Conflict of authorities

A clear division of tasks and a framework to ensure the accountability of the agencies involved in the road maintenance is essential. Heggie (2003) highlights the importance of the institutional frameworks and stresses that strengthening the institutional framework is a prerequisite to overcome the "the numerous technical, organisational and human resource constraints that hampered the introduction of better road maintenance policies." As there are conflict of authorities between the public works and the department of transportation, the public works agency as the agency which is responsible for the construction and the maintenance of the road networks, cannot be held accountable for the poor road condition, referring it as being a consequence of poor traffic loading control. Likewise, the department of the transportation cannot be held accountable for the poor road condition, referring it to the poor road construction quality, in addition to the lack of the weighing station facilities (more discussion in section 5.4.1.1.1.4)

Both institutions appeared to have reasonable claims and at the same time are responsible for the poor road condition problem. The research identified that the road infrastructure have been poorly constructed particularly due to the corruption, security threats, and poor

supervision quality. On the contrary, the department of transportation failed to monitor and control the maximum axle loading capacity of the passing vehicles due to corruption, and the lack of weighing station facilities. On top of that, the national law which regulates the enforcement of vehicle maximum axle loading capacity, which does not allow overloaded vehicles to pay for the excess loads and continue the journey, is not respected by the authorities at the regional level.

The high interest of the political leaders towards the business investment and the perceived economic growth in their areas which offered more immediate and direct contribution to the regions' income appeared to be more attractive to the decision makers. As suggested by Donnges et al. (2007), a recommended approach to the political interest problem would be to create a platform for discussion and demonstrate the worthiness of the road maintenance investments. Accordingly, the politicians will be made accountable for the road condition, and the technical staff need to be provided with the capacity, tools, and procedure to produce an effective road maintenance plan within the constrained budget; the absence of which may end up in both parties cannot be held responsible for the lack of road maintenance.

6.3.4 Financial capacity

The institutional factors include financial management, human resources, and organisation management. Out of the three institutional factors identified in the study, the financial management capacity and the human resource issues are argued as the most affecting factors to the road maintenance performance. The case study analysis of the financial management aspect of the road maintenance is presented in sections, 5.7.1.2.1, 5.8.1.2.1, and 5.9.1.2.1. The findings on the financial management demonstrate a close causal-relationship with the human resource issue, which will be discussed more specifically in the next section. The data analysis suggests that the road authorities at the district level lack the financial capacity for performing proper road maintenance.

6.3.4.1 The four financial problems

As highlighted by ADB (2003), the financial problems in the road maintenance are rooted to four issues; fund is not allocated in sufficient amount, allocated fund is not spent, fund allocation is not spent effectively, and fund allocation is not spent efficiently. These issues are

also identified in the case study districts. The vast areas of the districts, the extensive length of the road networks, and the limited budget availability indicate that the budget allocation for road maintenance may never be sufficient to cover the maintenance needs of the entire road networks. The global experience indicates that the financial resources for the road maintenance are rarely sufficient to cover all the road networks, even in the developed worlds (Zietlow and Bull, 1999, ADB, 2003, UNESCAP, 2005). However, as Donnges et al. (2007) argue, the fact that the whole maintenance financial needs can never be met does not mean that the maintenance cannot be done effectively with the available funds. They further suggest that the improvement of capacity at the local level has to be a major focus of any road administration if the limited available funds are to be spent effectively. Accordingly, it is argued that the road authority requires the capacity to create a list of priorities and distribute the limited budget allocation for the maintenance of road sections which provide the most benefit to both the communities and the local economy.

Additionally, the road maintenance budget in the case study district had to compete against the other sectors, as well as against other activities in the road sector such as the construction of new roads. This condition is commonly experienced in a country where the funds for road maintenance needs are allocated through the general government budgetary system. As highlighted by Gupta (2006) securing an adequate and steady flow of funds for road maintenance is impossible if it needs to go through the general budgetary allocation procedure, particularly if the allocation depends on the political debates.

The global experience suggests the establishment of a road fund mechanism as one of the solutions to the road maintenance financial problem. When the budget allocation for the road maintenance is distributed through the general account approach, it is exposed to inconsistent allocation sufficiency (ADB, 2003). Accordingly, the main advantages of establishing a road fund system are that it helps ensure that the budget allocation for the maintenance is used for the road maintenance, secure a steady flow of financial resources by excluding it from budget competition with other sectors, and implementing fairness and equity principle – those who used roads need to pay for the maintenance. Even though the regulatory framework to establish the road fund mechanism has been produced in Indonesia, it has not been in effect.

Hence, the road maintenance allocations need to be obtained from the general budgetary procedure.

However, the lack of sufficient budget allocation to cover the road maintenance needs as complained by the road authorities was worsened by the poor capacity of the road authority personnel to spend the approved budget allocation, and that the limited budget allocation is not spent efficiently and effectively for the maintenance of the road infrastructure (refer to Table 5.24 in section 5.10.1.2 regarding the case studies annual budget realisation ratio). Two factors have been identified as the main causes of the unspent budget; the poor spending capacity of the personnel and the delays in budget approval. The delays in the budget approval, which frequently resulted in a shorter implementation period and the project implementation period being deferred to the rainy season, should be avoided by improving the budgeting capacity and the approval process

Additionally, the limited budget allocation was also spent inefficiently. Budget allocation was largely spent for the routine expenditure such as salary, office administrations, and travels. The remaining allocation was also aggravated by the corruption and security issues; the contractors would need to pay to win projects and to avoid safety and security threats from certain individuals, and lowly paid supervision consultant would be threatened to relax the supervision. These conditions eventually resulted in the poor road construction quality.

Furthermore, there was also an issue in regard to the budget allocation being spent ineffectively. In some cases, the roads requiring rehabilitation were given periodic maintenance interventions, which impacts of intervention will vanish in a very short time. Road maintenance allocation was also used for upgrading road surface, and in some cases, concealed to fund the new road construction projects.

6.3.5 Human resources

The human resources of the case study districts were identified to be a great barrier in performing the proper road maintenance. As suggested by Karunasena et al. (2010), capacity building is a key concept for achieving sustainability in the developing countries. The study identified that there was an apparent need to improve the capacity of the local personnel, particularly in the road maintenance planning and procurement. The poor maintenance budget

distribution and allocation is not entirely due to the political pressure. The road authorities and the local governments in general, appeared to lack the skills and willingness to produce a well-justified budget proposal to the parliament. Accordingly, the annual budget proposals were commonly prepared as a slightly modified budget allocation of the previous year, which might not represent the actual needs (refer to section 5.7.1.2.2, 5.8.1.2.2, and 5.9.1.2.2 regarding the human resource issues)

This finding is supported by Donnges et al. (2007), who have identified that the capacity of the local road authorities are frequently insufficient to deal with the responsibility they had been assigned to. They further list the requirements as: technical staff, a thorough knowledge of road network, sound procedures for road condition inventories, efficient planning procedures, effective procurement systems, good supervision, adequate logistical support, transparent and up-to-date reporting, and reliable financial management. In the case study districts, the lack of skilled personnel, inappropriate educational background, and the poor recruitment system in the district road authorities are suggested as the main human resource issues in the case study districts.

6.3.5.1 Accountability issue

As highlighted by Donnges et al. (2007), the limited technical capacity of the road authority at the local level results in the lack of information on the state and size of the local road networks. Comparably, the road authorities in the cases study districts were unable to produce a reliable and accountable road maintenance planning. The road authorities of the case studies appeared to lack the skills and willingness to produce a well-justified budget proposal to the parliament Additionally, the lack of initiative, and also support, to produce a road information management system which was required to justify the maintenance budget proposal consequently resulted in the road maintenance needs being neglected, particularly due to the unreliability of the submitted road maintenance planning proposal. Donnges et al. (2007) conclude that performing the efficient and timely maintenance involves “the capacity to plan and carry out the works at the right time, preserving investments with solutions which are cost-effective and thereby utilising available funding resources in the most efficient manner.”

Furthermore, the budget allocation for the road maintenance was also not set as a recurrent budget and what was included and referred to as road maintenance were not clearly defined in the budgeting process. This finding is in line with Donnges et al. (2007) study, which states that the budget for road maintenance is often listed as a development budget and ineffectively spent to repair roads that are unmaintainable. As identified in the case study district, the budget allocation for the road maintenance was dominated by rehabilitation and surface upgrading activities, which has little contribution to the real aim of road maintenance which is to preserve the road condition and prolong the asset life.

Additionally, the poor capacity of the local consultants was also argued to have contributed to the slow human resource development process. As identified in Aceh Barat Daya, the transfer of knowledge from the local consultants to the road authorities' personnel which was expected to occur from the interaction between the two institutions did not materialise. Rather, it appeared that the road authority had to frequently give instructions and advices to the consultant personnel regarding the work implementation and methods, instead of vice versa (section 5.9.3.2).

6.3.5.2 Capacity building challenges

The poor capacity of the local governments was aggravated by the poor interest in the capacity building programs. The capacity building programs for the road authority personnel in the case study districts lacked the support from the political leaders. Budget allocation was spent on activities and programs which could attract the public interest and yield more immediate and visible benefits. Consequently, the road authorities at the local level could not initiate capacity building programs, and invitations to participate in trainings and workshops from the external organisations were turned away due to the lack of budget to cover the basic costs such as accommodation and travel fare (section 5.7.3.2, 5.8.3.2 and 5.9.3.2). Whereas, as previously highlighted by Robinson and Stiedl (2003), the benefit of having a decentralised road management system in developing countries, i.e. laying the highest responsibility for road management at the local level, can only be assured through a long-term investment in establishing an effective system at the local level and building the local capacity. Donnges et al. (2007) partially blame such condition to the lack of efforts to ensure that the local authorities possess the knowledge and skills to effectively deal with the road maintenance during the

decentralisation process. They further argue that the existence of appropriate capacity is the key to the effective implementation of road maintenance, on top of the existence of the political will, changed attitude, and the financial availability.

Furthermore, the challenges in the capacity building efforts in the case study districts appeared to be rooted in four factors; poor political interest, poor budget allocation, personnel issues, and poor capacity building programs. Technical positions were frequently filled with poorly skilled – and inappropriate educational background personnel. The available capacity building programs were frequently argued to be poorly designed. Consequently, the knowledge transfer process expected to occur from the various capacity building programs did not yield the expected results, where many claimed to have learned the required skills from the informal interactions between colleagues. This condition was argued to be affected by the rapid decentralisation process which had not been followed by adequate capacity building programs.

6.3.6 The positive affecting factors

The above sections have identified and provide discussions on the factors which negatively affected the local governments' road maintenance capacity. However, the research also identifies several positive affecting factors which help increase the opportunity to properly maintain the road networks. More discussion on these factors will be presented in the following paragraphs.

First, the peace agreement between the Aceh Free Movement and the Government of Indonesia ends the conflict that took place for more than thirty years in Aceh. As the safety and security conditions have significantly improved, the local government can now implement projects in the rural areas which were isolated during the conflict. More discussion regarding the conflict in Aceh is presented in section 2.5.7. Second, the special autonomy status of the Aceh province provides the local government additional budget allocation. The additional allocation may accordingly help improve the condition of the local roads, provided that the allocation resources are properly managed. More discussion on the special autonomy status of the Aceh province is available in section 2.5.6 . Third, post-disaster reconstruction activities have improved the overall road condition in the case study districts. The maintenance backlog has been reduced significantly, which provides the local governments opportunities to

gradually increase their maintenance budget allocation and improve their road maintenance planning capacity. Fourth, the establishment of road transport traffic board was argued to have resulted in better coordination between the road stakeholders (section 5.4.1.1.1.4). Even though the actual impacts and contribution of the traffic boards towards road condition need to be further investigated, it has however provided the platform for the stakeholders in the road sectors to communicate and discuss issues in the road sector.

The road maintenance capacity affecting factors have been discussed in details in the above section. Not only has the research identified the negative affecting factors, the factors which positively contribute to better road maintenance capacity have also been acknowledged. Table 6.1 provides a summary of these factors.

Table 6.1 – Road maintenance capacity affecting factors

Negative Factors	Positive Factors
Political intervention and social pressure deviate the development priorities	*Improved safety and security after the conflict ends enables implementation of projects in the rural areas*
The high preference on road capital projects undermines maintenance needs	*Special autonomy status provides more financial resources*
Community's lack of sense of ownership accelerate road deterioration	*Post-disaster reconstruction activities reduce road maintenance backlog*
Economic consideration harms traffic loading enforcement	*Establishment of road transport and traffic board improves coordination between road stakeholders*
Corruption hampers road maintenance planning and traffic enforcement	
Conflict of authorities damages accountability	
Inadequate human resource capacity damages accountability	
Capacity building programs do not get sufficient support	

6.4 Post disaster road reconstruction process

The previous section focuses on the capacity of the local government in the maintenance of the road infrastructure assets after the post-disaster reconstruction activities have ended. This section is therefore dedicated to presenting a discussion on the links between the local

governments' road maintenance capacity and the post-disaster reconstruction process in the case study districts. Accordingly, this section will mainly provide a discussion based on the result of the semi-structured interviews with the high-level officials and policy makers as elaborated in more detail in section 5.4 of chapter 5)

6.4.1 Asset transfer issue

The issue of asset transfer in the post-disaster reconstruction in Aceh is analysed from the semi-structured interviews with the high-officials and the policy makers (section 5.4.2.3). In the reconstruction of Aceh, the ownership status of the reconstructed roads need to be transferred and listed as the BRR assets before they were transferred back to the local governments after the completion. Consequently, the changing of asset ownership status led to a series of problems and was accordingly identified as one of the major challenges in the reconstruction.

Even though the literature has covered a wide range of asset management issues in the disaster management context (e.g. Vatsa (2004), Salmerón and Apte (2010), Warren (2010), Kalamaris et al. (2012), Rademacher (2013)), the concerns regarding the asset transfer process in the post-disaster reconstruction has not been sufficiently discussed. The findings of this research are therefore expected to fill the gap. From the data analysis, the problems experienced in the asset transfer process are considered to be avoidable if the road assets ownerships had not been transferred from and back to the local governments. As the asset transfer process resulted in delays and maintenance issues, it is argued that the BRR should have rehabilitated and reconstructed the road infrastructure for the local governments without having to change the asset ownership status, even though such arrangement may need special legal and regulatory supports from the national government. The identified problems were related to the asset management capacity, asset valuation method, project administration, land registration, poor asset condition, time gap, and the environmental impact (see 5.4.2.3).

The rigidity in applying the regulation in the post-disaster context proved to be resulting in road assets being neglected from maintenance. Additionally, if asset change of ownership was required, the reconstructed assets would need to be returned back to the local governments immediately after their completion. Accordingly, a definite set of rules and regulatory arrangement was required. As also suggested by the experts interviewed in the study, the

regulations and agreement regarding asset ownership had to be achieved prior to the reconstruction, and even more, prior to the occurrence of the disaster. This is particularly since discussing such arrangement in the post-disaster reconstruction period would be too late as the focus would be placed on meeting the needs of the affected people in a speedy manner (section 5.13.1). Accordingly, the local governments might not refuse to accept and maintain the reconstructed assets as experienced in Aceh. As a result, the argumentations and excuses justifying the maintenance neglects resulting from the asset transfer problems can be eliminated, provided the road projects are handed-back to the local governments immediately after the project completion.

6.4.2 Consideration of road maintenance needs

The extensive scale of the road infrastructure reconstruction in Aceh raises a concern over the maintainability of the assets in the long run by the local governments. However, the research finds that the consideration of the future road maintenance needs had only been partially accounted for in the reconstruction plan, which was mainly through the maintenance MoU between the local governments and the BRR, and the application of high quality road specification standard (section 5.4.2.2). However, the requirement of the maintenance MoU only covered a relatively small number of the district road projects (those co-funded by foreign donor). Even more, the maintenance MoU, were eventually not respected by the local governments of the case study districts due to a number of reasons, including political, financial, and bureaucratic procedure in the asset management area. However, even if the MoU had been respected, nevertheless, Donnges et al. (2007) suggest that the local governments are often left obliged to allocate the limited maintenance budget for roads that may not necessarily be priorities to them. As a result, such maintenance agreement may result in the local governments maintaining the road sections required by the MoU at the cost of neglecting maintenance of other road sections not included in the MoU.

The findings of the research on the issue of considering the future maintenance needs in the post-disaster reconstruction process, conforms with the conclusion made by Karim (2011). With regard to the problems that lead to insufficient considerations towards maintenance aspects during the planning and designing process, he highlights that the problems of poor consideration of the maintenance needs are rooted to six categories: insufficient consulting,

insufficient knowledge, the absence of regulation and specification considering the maintenance aspects, insufficient planning and design activities, as well as inadequate organisation and demands from other authorities.

However, the nature of the post-disaster reconstruction limits the applicability of the procedures for the normal development context. As argued by Alexander (2004), post-disaster projects struggle with a more complex, dynamic and chaotic environment compared to construction projects in a normal situation. The level of destruction caused by the tsunami created a high pressure to ensure that the needs of the affected communities were met and that the affected area could recover as soon as possible. Arguably, the future maintenance needs were therefore not well considered, particularly since the availability of fund for the reconstruction of the road infrastructure was virtually unlimited. Another rationalisation for the reconstruction agencies to omit the needs for future maintenance was due to the additional financial resources the Aceh regional governments would receive as part of the special autonomy status, as the additional fund was expected to be sufficient to cover the financial needs of the road maintenance (please refer to section 2.5.6 regarding the special autonomy status of Aceh province).

With regard to the consideration of future road maintenance needs in the post-disaster reconstruction process, it is argued that the road maintenance needs should be better accounted for in the planning phase as an integrated part of the road reconstruction program. This means that a road reconstruction program should not only cover the cost of the reconstruction of the road infrastructure, but also the maintenance cost. The experience of the rural road programme in India, Pradhan Mantri Gram Sadak Yojana - PMGSY, has suggested a successful story by including the maintenance needs for the 5 year period in the road rehabilitation contract (Donnges et al., 2007). The additional benefit of implementing such a program is that it may provide a gradual transition in the process of introducing the culture of road maintenance to the local authority.

Furthermore, the result of discussions with the interviewees suggests that the application of higher road surface quality standard, on the other hand, seemed to have a positive short term impact on the durability and serviceability of the respective district roads. However, the lack of

maintenance of the reconstructed assets raises two concerns on the long run. First, without maintenance, the reconstructed assets will soon deteriorate and lost the investment value. As highlighted by Harral and Faiz (1988), road infrastructure will deteriorate rapidly after the end of the grace period, which is around 6-7 years of service period. As the BRR closed in 2009 most of the reconstructed roads are now at least in the fifth 5 year of service. Accordingly, the road will start to deteriorate rapidly in the following two or three years.

The absence of road maintenance culture in the local governments makes it difficult to see that proper intervention will be performed and that the financial resources will be available when it is crucially needed in the near future. Secondly, the application of the high road surface quality standard, on the one hand, appeared to have delayed the maintenance needs, and prolonged the serviceability of the district roads. The improved road condition in the district was also believed to have largely contributed to the rapid recovery of the affected areas and was also argued to have offered a greater opportunity for the economic development of the case study districts. On the other hand, however, the application of the new road surface type also creates a new 'perspective on the road authority, and probably in the community as well regarding the 'proper' road surface design. The road authorities seemed to aim at building and upgrading the road networks in their areas into hot mix asphalt (HMA) pavement type, as it is now perceived as the 'proper' pavement surface standard (please refer to section 5.13.2 for the experts' views on this issue). Consequently, with the lack of road maintenance culture in the district road authority, such view potentially means that the roads will be more expensive to build, require greater budget allocation, reduced maintenance allocation sufficiency, and more importantly that the new road pavement will also deteriorate rapidly and that the investment value will also diminish shortly.

Additionally, regarding the selection of the high quality pavement alternative (HMA), as argued by Donnges et al. (2007), the fastest increase in the socioeconomic benefit is obtained when the access is provided in the first time, and when it is kept open all year. They further conclude that the road improvement and upgrading also offer the least significant socioeconomic improvement. Accordingly, the research recommends that the road authorities need to take into account the necessity and the Cost-Benefit ratio of the various road pavement types to be applied in their area, particularly for the low volume traffic roads. The implementation of high

quality pavement alternative, such as HMA, as a shortcut to prolong road maintenance needs do not justify the higher investment cost and the abandonment of regular road maintenance needs.

6.4.3 Local government involvement

The involvement of the local governments in the post-disaster reconstruction of road infrastructure in Aceh was conducted through four approaches; inputs gathering, recruitment and assignment of the local government employees in the reconstruction agencies, the distribution of tasks and coordination, and through the establishment of the joint secretariat at the district level (refer to section 5.4.2.1).

The involvement of the local governments in the reconstruction process was mainly through the recruitment and assignment of local government personnel in the BRR, and through the establishment of the joint secretariat office at the regional level. However, being victims of the disaster, the local government could not be actively involved in the post-disaster reconstruction. Accordingly, even though the responses from the interviewees regarding the level and quality of the local governments' involvement in the post-disaster reconstruction varied, they generally suggested the post-disaster condition as the main constraint to the effective and efficient Local governments' involvement.

As described in detail in section 2.2.5.3, Kenny (2007b) highlights five major reasons for the exclusion of the locals in the reconstruction process. The first reason related to the scale of the destruction and the urgency for quick actions. The second reason is due to the curtailed freedom to work with the locals by the government and military surveillance. The third reason is owing to the sheer complexity of the reconstruction, which is affected by the pre-disaster level of the government authority and exercise of power as well as by the destruction of the official records. Furthermore, she claims that the established paradigm of Eurocentric notions which separates the worlds into 'south' and 'north' or 'developed' and 'underdeveloped' regions has been the fourth reason to the exclusion of the locals. The fifth explanation is regarding the marketization or commercialisation of the disaster aid programme.

6.5 Safety and security – A post-conflict area

The challenges experienced in the reconstruction of the disaster-affected area in Aceh were exacerbated by the fact that Aceh is also a post-conflict area. The data analysis on the impact of safety and security issue on the road maintenance is discussed in section, 5.7.1.1.4, 5.8.1.1.4, and 5.9.1.1.4.

From the data analysis, it emerged that the reconstruction of the road infrastructure was primarily challenged by the oppressive behaviour of the community, illegal extortion of the 'security fee', and safety threats which contributed to the relaxed construction supervision. These challenges eventually affected the implementation of the road reconstruction project in the form of project disruptions, higher project costs, and poor construction quality. These challenges conform with the World Bank (2009a) report, which suggests that that conflict also change the behaviour, preferences, and institutional functioning resulting from the compromised security of individuals and communities.

Additionally, the findings demonstrate close connection and similarities with the challenges of infrastructure reconstruction in a post-conflict setting as suggested by Anand (2005). As identified by Anand (2005), the reconstruction of infrastructure in a post-conflict settings has to face at least nine challenges, which make post-conflict reconstruction different from infrastructure development in the normal condition. The nine challenges are: conflict is often a complex situation caused by a mix of economic, political, and social and historical condition; different perception on the level of importance of infrastructure reconstruction; weakened state institutions, eroded trust, and increased transaction cost; demoralised workers and delays resulting from confrontation with the opponent of peace; 'missing the baseline', which is the necessity to cover those which have deteriorated due to the maintenance neglect and those required to accelerate the recovery; the displacement of people, leading to scarce local resources; the role of visual media, which may exaggerate the effect of infrastructure failure; increased expectation of the local community regarding the standards and quality of infrastructures to be provided; and the governance dilemma with regards to determining the higher priority between institutional rebuilding and infrastructure reconstruction.

Additionally, as further argued by Anand (2005), the principals of fairness and equity might be considered to be more crucial than resource efficiency in a post-conflict reconstruction. In Aceh, this condition was indicated by the higher focus of the reconstruction on the needs and the scale of the road infrastructure reconstruction, with little focus was addressed at the long-term maintenance needs. Being in conflict for nearly thirty years, the poor economic condition of Aceh also affected the decision-making process and was in fact considered as a major driving force in the tsunami reconstruction process. Hence, in addition to having to restore and rebuild the impacts of the disaster, the reconstruction in Aceh had also to include the need to restore the impacts of the prolonged conflict. Related to this concern was the impact of the local socioeconomic condition to the local governments' road maintenance capacity. This has been discussed in more detail in section, 5.7.1.1.3, 5.8.1.1.3, and 5.9.1.1.3.

From the local government point of view, the issue of fairness and equity was also considered as a major external challenge in the road maintenance efforts. In the broader view, the impacts of the political condition, as discussed in section, were also argued to be affected by the post-conflict situation in Aceh, particularly where the local parliaments and the heads of the local governments were dominated by the ex-combatants, or those who supported them (please refer to section regarding the factors, and Table 5.3, Table 5.8, and Table 5.13 regarding the composition of the parliament members in the case study districts).

To sum up, on the one hand, the impacts of conflict were experienced in the road reconstruction process. Security and safety threats were experienced more widely and were also conducted more openly. However, on the other hand, the level of risks and severity of the threats posed by the community and individuals in the post-conflict period in Aceh was also suggested to be lower than it was in the conflict period. As a result, the peace agreement in Aceh has provided an opportunity to expand the road infrastructure program to reach the remote areas, which was abandoned and isolated during the conflict period.

Nevertheless, the discussion of the impacts and influences of the post-conflict condition on the post-disaster reconstruction and the capacity of the local government in the maintenance of the road infrastructure would require a comprehensive and thorough investigation. To what extent the post-conflict condition affects the political decision in Aceh was outside the context

of the study. Accordingly, as this research is not specifically focused on the post-conflict setting, it is therefore recommended as the further research.

Moreover, as the findings suggest, the impact of the post-conflict in Aceh has to be seen as a context rather than merely as a category of factors affecting the local governments' road maintenance capacity. Accordingly, this is reflected in the updated conceptual framework of the study, which will be discussed in section 6.6 further below.

6.6 Refined Conceptual Framework

The findings from the empirical analysis have provided the inputs essential for the refinement of the conceptual framework developed in the earlier phase of the study as presented and discussed in chapter 4. The issue of asset transfer and post-conflict area are included in the framework to reflect the relevance of the issues as they emerged in the research findings.

The refined conceptual framework of the study, as illustrated in Figure 6.1, accordingly helps provide a framework for evaluating the capacity of the local government in the maintenance of the road infrastructure and the links to the post-disaster reconstruction process. More discussion on each of the components in the framework will be presented in the following section.

6.6.1 The components of the conceptual framework

The refined conceptual framework, as presented in Figure 6.1, incorporates the various phases of the road project life-cycle and their positions with regards to the post-disaster management and road maintenance activities. The road reconstruction process, which take place in the post-disaster reconstruction period highlights the need to consider the future road maintenance needs and the involvement of the local governments in the reconstruction process. The "consideration of future road maintenance needs" accordingly include the political interest, technical design, project funding mechanism, donor attitude regarding conflicting and enforcing regulations and consideration of future maintenance needs, and the existence of regulations and agreement on maintenance responsibility. The "local government involvement" highlights the need to properly investigate the impacts of disaster and the resiliency level of the affected local governments, the contributions and role of the local

governments in the planning process, the recruitment and placement of local governments' personnel in the disaster reconstruction and rehabilitation executing agency, and the coordination and distribution of tasks between the stakeholders of the post-disaster reconstruction process.

The "road maintenance" underlines the various factors affecting the local governments' capacity in maintaining the road infrastructure. These affecting factors are grouped into three main categories; external, institutional and technical factors. These factors need to be sufficiently accounted for in the post-disaster reconstruction planning, as they greatly determine the sustainability of the road reconstruction assets.

The "asset transfer" box accordingly highlights the main issues in the asset transfer process, which take place in the transitional phase between the post-disaster reconstruction and the normal development context. These issues include the need to have pre-established regulations and agreements regarding the asset transfer condition. Such arrangement should be made available prior to project commencement, and even prior to the disaster occurrence which covers the asset valuation methods as one of the sources of dispute in the asset transfer process. Furthermore, there is also a need to immediately transfer the assets back to the relevant governments in order to avoid future disputes resulting from unclear ownership status. Other factors requiring detailed attention include the asset management capacity of the local governments and personnel involved in the post-disaster reconstruction activities, project administration and documentation required for the asset transfer process, as well as the land registration process resulting from the land acquisition process.

The "safety and security" aspect illustrates the need to continuously assess the condition and impacts of the safety and security to the project implementation. The safety and security issues spans across the whole road project life-cycle and therefore require attentions in the reconstruction, asset transfer, as well as the road maintenance process. Likewise the "safety and security", the "capacity building" also span across the road project life-cycle. This demonstrates the need to sufficiently incorporate the capacity building programs in the reconstruction process, transitional phase, and the road maintenance process.

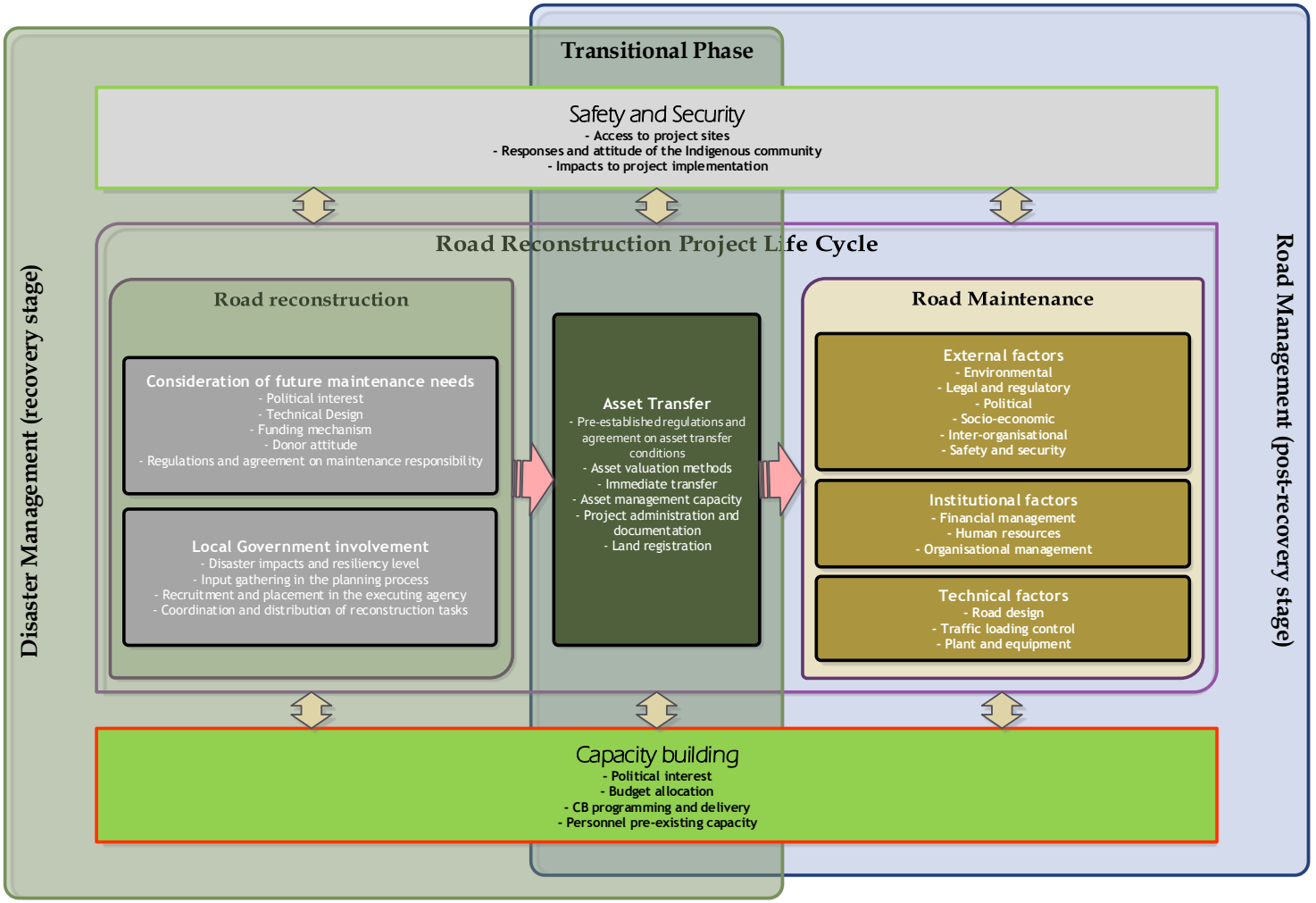


Figure 6.1 – Refined conceptual framework

Chapter - 7 CONCLUSION

7.1 Introduction

The background and justification for conducting the research is presented in chapter 1. Chapter 2 elaborates the result of the literature review on the subjects relevant to the research topic. In chapter 3, the research methodology adopted in the study in order to achieve the aim and objectives of the research is presented. The development of the conceptual framework is discussed in chapter 4, followed by the analysis of the primary data gathered from the semi-structured interviews in chapter 5. Chapter 6 presents the findings of the research. Chapter 7, this chapter, presents the conclusions of the study by summarising the results of the study. Accordingly, this chapter is structured as the following

- First, the relevance of the findings to each objective of the study will be summarised
- Second, the contribution of the research to the theory and practice are presented
- Third, the limitations of the study are discussed
- Finally, recommendations for further research are suggested.

The following section will therefore present the findings for each objective of the study

7.2 Summary of key findings

As stipulated in section 1.3, the aim of the study is to evaluate the capacity of the local government in the maintenance of the road reconstruction assets. To help achieve the aim of the research, four objectives have been identified. Accordingly, the findings for each of the objectives will be elaborated in the following sections.

7.2.1 Objective 1: To explore the road infrastructure reconstruction process, policy and management model in Indonesia at the national and the local government level

The reconstruction of the road infrastructure in the post-tsunami recovery in Aceh was coordinated by the BRR, the agency appointed to coordinate the rehabilitation and the reconstruction in Aceh and Nias. Most of the road networks in Aceh were reconstructed by BRR and big donor agencies such as the World Bank, USAID, JICA, and ADB. Other donor agencies,

such as ILO and GTZ, also worked on a relatively smaller scale. The involvement of the local government in the road reconstruction process was mainly through input gathering for the blueprint, the assignment of their personnel in the BRR, and the establishment of joint secretariat at the district level to meet the needs of the local people and ensure that the duplication and gaps of works could be avoided (section 5.4.2.1).

The management of road infrastructure in Indonesia follows the government administration system, which has been decentralised rapidly since 1999. Accordingly, the national roads are managed by the national government – through the MPW. At the regional level, the provincial roads are managed by the provincial governments and the management of the district roads are therefore under the responsibility of the local governments, through their public works agencies (detailed discussion is presented in section 2.5.4.1). In practice, the responsibility of the national road management is partially placed on the provincial governments, as the representatives and the extended hand of the national government at the regional level. The construction and the maintenance of the national road networks would be executed by the provincial road authorities, funded by the national government, and the activities are accordingly listed in the national budget. Due to the decentralised system, which is placed at the district level, the MPW is unable to provide budget allocation and implement projects at the district level, but is however able to implement projects at the provincial level, providing that they meet the requirements (section 5.4.1.1.1.4).

The national government assistance on the road infrastructure at the district levels in Aceh, however, is exercised in a more general approach. The provision of assistance to the regional governments by the national government is implemented through the allocation of Specific Grant Allocation (DAK). The DAK is a grant provided by the national government to the regional governments for specific purposes only, which are authorised by the MoF, and detailed by the respective line ministries. According to the regulation of MPW no 15/PRT/M/2010 article 10, for the road sector, the DAK fund can only be used for the periodic maintenance, rehabilitation and surface upgrade, as well as for completing the short-funded road construction projects.

7.2.2 Objective 2: To identify and analyse the obstacles and challenges of road reconstruction in post-disaster context

The study reveals that the post-disaster road reconstruction projects in the case study districts were exposed to significantly challenging situations. Whilst most of the risks and challenges were commonly experienced in road projects in the normal development context, the scale of the risks had been frequently underestimated. The post-disaster reconstruction projects struggle with more complex, dynamic and chaotic environment which were identified in the finalisation of the project design and the land acquisition process.

This condition was also aggravated by the relatively few aid agencies focusing on the road sector, and that the local governments, as one of the key stakeholders in the reconstruction process were also victims of the disasters. The challenges experienced in the reconstruction of road infrastructure in the case study district include administrative issues resulting from conflicting regulations and unfamiliarity with the local conditions, the limited availability of skilled professional, dispute between local contractors and the local partners, price increase, the difficulties in obtaining bank loan due to the global financial crisis, as well as the security issue which were affected by the post-conflict condition of Aceh province. More detailed discussion of the obstacles and challenges in post-disaster road reconstruction is covered in section 2.3.5.

7.2.3 Objective 3: To analyse the local government's roles in the road infrastructure reconstruction and their capacity in the maintenance of road infrastructure assets.

The role of the local government in the post-disaster road reconstruction process is elaborated in section 5.4.2.1. The study identifies that the local governments were involved in the post-disaster reconstruction by four means; input gathering, recruitment and assignment of local government employees in the BRR, coordination and distribution of tasks, and the establishment of the joint secretariat. Accordingly, the study identified that the capacity of the local government of the case study districts in maintaining the roads were very poor. Road reconstruction assets were neglected from maintenance, and the road development programs were focused on rehabilitating and upgrading the road surface, as well as on the network expansion (please refer to the road maintenance strategy, section 5.7.2, 5.8.2, and 5.9.2).

The study has also identified the factors affecting the capacity of the local governments in maintaining the road infrastructure. These factors are grouped into two major categories; external and internal. The external factors affecting the poor maintenance capacity are described in section 5.10.1.1. The internal factors are divided and discussed in two sections; section 5.10.1.2 covers the institutional factors and section 5.10.1.3 accordingly elaborates the technical factors.

7.2.4 Objective 4: To develop a framework for post-disaster reconstruction of road infrastructure

The final objective of this research is to develop a framework for post-disaster reconstruction of road infrastructure. Accordingly, a conceptual framework was developed aiming at enabling a successful reconstruction and sustainable asset focussing on the maintenance aspect. The conceptual framework was developed by identifying the key issues and main subjects which are relevant to the research aim through comprehensive literature reviews. The key issues were then fine-tuned in accordance with the result of the pilot interviews (section 4.4 of chapter 4). The process of developing the initial conceptual framework is illustrated in Figure 4.1 in section 4.4, and the resulting initial conceptual framework is illustrated in Figure 4.2 in the same section.

As the research progressed to the analysis of data collected from the documents and archival records as well as the semi-structured interviews with the high-level officials and policy makers, stakeholders at the local level, and the experts in the disaster management and road infrastructure development, the theoretical framework was further refined. Additionally, the findings of the research, as presented in chapter 6, suggest a number of issues which need to be addressed in the road infrastructure reconstruction process. Based on the empirical investigation, the conceptual framework for the reconstruction of road infrastructure in the post-disaster reconstruction context is accordingly refined. The refined conceptual framework is presented in section 6.6, as Figure 6.1. The conceptual framework exhibits the three phases of the road infrastructure reconstruction in the post-disaster context, which spans from the reconstruction to the post-reconstruction period and highlights the significance of the asset transfer process during the transition period. In addition, the conceptual framework shows the identified concerns and issues in each of the reconstruction phase, which enables and assists

the post-disaster reconstruction of road infrastructure achieving a successful and sustainable post-disaster reconstruction asset.

7.3 Contribution to the theory and practice

The contribution to the theory and practice presented in this section is mainly established from the findings of the research as presented and discussed in detail in Chapter 6.

7.3.1 Contribution to theory

Achieving the aim and the objectives of this study required the combination of literature review of two major areas; disaster management and road maintenance. Additionally, providing the context for the case study accordingly required the discussion on the issue of capacity building, local governance, and the post-conflict reconstruction (refers to chapter 2 regarding the literature review).

By merging the concepts and theories on the various subjects, this study provides a better understanding of the complex issue of road infrastructure reconstruction in the disaster affected areas, which at the same time also happened to be a post-conflict area. The contribution that the study has provided to theory is presented in the following paragraphs.

7.3.1.1 The identification of challenges and obstacles in performing road maintenance in the post-disaster affected areas in a developing country

The study has contributed to the theory by providing an in-depth discussion of the main factors affecting the local governments' road maintenance capacity. The study identified and grouped the external factors affecting the road maintenance capacity of the case study districts into six broad categories, namely environmental, legal and regulatory, political, socioeconomic, safety and security, and inter-organisational relationship (section 5.10.1.1). The internal factors affecting the maintenance capacity have been identified in the area of financial management, human resources, and the organisational management (section 5.10.1.2). On the technical side, the road maintenance capacity of the local governments is mainly affected by the road design, traffic loading control, as well as the plant and equipment condition (section 5.10.1.3).

7.3.1.2 Linkages between road reconstruction process and road maintenance

Furthermore, the study has particularly observed and established linkages between the road maintenance capacities of the local governments and the post-disaster road reconstruction process. The study proves that putting into account the future road maintenance needs into the road reconstruction planning and programming have been difficult due to the dynamic and chaotic environment of the disaster reconstruction activities, the high pressure to rapidly meet the needs of the affected communities, and particularly due to the fact that the reconstruction involved ad-hoc organisations and temporary emergency projects.

On the other hand, the study notifies that the introduction and the wide use of the high grade pavement type in the post-disaster reconstruction, as one way to prolong the maintenance needs, leads to a cultural change in the local road authorities. It appears that the local governments are aiming at improving and upgrading the district road networks to the Hot Mix Asphalt pavement type as the new 'appropriate' surface standard. Such view essentially neglect the necessity and advantages of the various pavement alternatives, and at the same time increase the possibility of maintenance neglect as more financial resources would be channelled for the construction of the high specification pavement type. Detailed discussion on this issue is presented in section 5.4.2.2.

7.3.1.3 How the post-conflict situation affect both the road reconstruction process and the road maintenance efforts.

From the project execution point of view, the study has also identified the impacts of the post-conflict to the road reconstruction and road maintenance process. The study identified that the impact of the post-conflict condition have been seen in the community's oppressive behaviour and the more open practice of illegal extortion known as the security fee. This condition aggravated the project disruptions and relaxed supervision commonly found in the road construction projects. However, on the positive side, the peace agreement has also improved the possibility to expand the coverage of the development programs to also reach the remote areas, which was not possible in the conflict time.

7.3.2 Contribution to practice

The findings of this study have provided essential inputs to both solving the district road maintenance problems and the post-disaster road infrastructure reconstruction. First, the identification of road maintenance capacity affecting factors has produced a list of concerns that practitioners involved in the road maintenance sectors need to put into account in their road infrastructure project planning and programming.

Furthermore, the establishment of linkages between the road maintenance capacity and the post-disaster reconstruction process offers a comprehensive overview on the process and experience of post-disaster road reconstruction efforts, which focused particularly on maximizing the value of investments made in the reconstruction. Such overview, would serve as lessons learnt and recommendations for any road reconstruction activities in a post-disaster context. Some of the organisations that may benefit from the research are local governments, road management authorities and disaster management agencies. More discussion will be presented in the following sections.

7.3.2.1 Local governments and the road management authorities

The research identifies the main factors affecting the local governments' capacity in the maintenance of the road infrastructure from the external, institutional, and the technical aspect. The local governments may therefore benefit from the study by identifying the existence of these factors in their institutions and address the issues accordingly. The road management authorities and local governments may accordingly adopt and adapt the findings of the studies to their road infrastructure maintenance initiatives and contextualised the concept to suit their needs.

7.3.2.2 Disaster management agencies

As stipulated earlier, the research establishes linkages between the post-disaster reconstruction of the road infrastructure during the disaster recovery period and the road maintenance initiatives performed by the local governments after the post-disaster reconstruction activities are completed. The research highlights the importance of considering the future road maintenance needs and local governments' capacity into the disaster reconstruction plan, as the sustainability of the reconstruction assets and the value of the

investment made in the reconstruction are highly dependent on the local governments' maintenance capacity. Accordingly, the research suggests that the future road maintenance needs need to be integrated into the disaster recovery plan before disaster occurs, as in the post-disaster reconstruction period the main focus will be drawn on meeting the needs of the affected people and the speedy recovery of the affected areas. In addition, the research also highlights the importance of carefully selecting the technology to be implemented in the reconstruction of road infrastructure and to fill the gap in the local government capacity through various capacity building programs which specifically aim at improving the local government road maintenance capacity.

7.3.2.3 Hyogo Framework for Action

From the road infrastructure perspective, the results from the case studies provide strong links and contributions to the Hyogo Framework for Action (HFA) priority actions, particularly the priority actions no 1, 3, and 4. The priority action 1 of the HFA is focused on ensuring that policies and legislations are established at the national and the local level. This priority action was addressed by the research through highlighting rules and regulations which support or hinder the effective post-disaster road reconstruction and road maintenance. The research also contributes towards meeting the priority action 3, which are focused on the use of knowledge to build a culture of safety and resilience at all levels, by providing lesson learnt from the reconstruction and the maintenance of the road infrastructure in the case studies. With regards to priority action 4 – reduce the underlying risk factors, the research has contributed to this action by identifying the various factors affecting the local governments' capacity in the maintenance of the road infrastructure.

7.4 Limitations of the study

Being a PhD research, the study is challenged by the typical constraints of time and resources. This research is conducted using the multiple case study approach as the replication logic to ensure the external validity of the research findings. The three case studies selected are located in the province of Aceh. This is mainly due to the availability of access to data and the fact that this research is financially sponsored by the provincial government of Aceh. Even though the external validity has been achieved, attempting the generalisation of the research findings

needs to put into account the limitation of a research using a case study approach, which is primarily constrained by the context of the research; represented by the research objectives and the case study selection criteria.

Another limitation of the study is associated with testing the applicability of the theoretical framework established by the study. The limitation of the PhD research period and the lack of access and authority to apply the proposed framework into practice are also acknowledged as the further limitation of the study.

7.5 Further research

The recommendations for further research discussed in this section are primarily resulted from the limitations of the study as presented in the previous sections. Based on the limitations of the study, the further research recommendations are:

7.5.1 A comparable case study research on other developing or developed countries

This study is conducted in three districts in Aceh province as the case studies. Considering that the research is context specific, future research may consider doing a comparative case study research in either the developed or developing world. A similar study conducted in the Sri Lanka, for instance, would draw an interesting comparison study as both areas share similar characteristics; both were affected by the Indian Ocean tsunami, both located in the developing countries, and both are also post-conflict areas.

7.5.2 Application of the developed conceptual framework

As stated in the aforementioned sections, one of the limitations of the study is the inability to test the applicability of the developed conceptual frameworks. Accordingly, provided that the constraint of this research can be overcome, a future study can therefore be conducted on testing the applicability of the frameworks. Consequently, the theoretical framework may be updated and modified based on the outcomes of the study.

7.5.3 Detailed observation on one particular maintenance affecting factor

The lack of previous study conducted on the issue of local government post-disaster road maintenance capacity had led the research to identifying the various factors affecting the

capacity of the local government in the maintenance of the post-disaster road reconstruction assets. This yields rather breadth discussions of each of the affecting factors. Accordingly, future research may undertake a deeper investigation on how a particular concern, for instance the local political condition or human resource capacity, affects the overall road maintenance capacity of the local government.

7.6 Final note

This chapter summarises the findings of the study obtained from the literature, case study investigation and the semi-structured interviews with the stakeholders, and the expert interviews. Even though the literature has covered a vast range of issues in the disaster management, road maintenance, as well as the post-conflict reconstruction, the study identified that there is a gap in the literature which put the three major subjects in the same context. By successfully achieving all of the research objectives, the study has contributed to the theory and practice. Moreover, the limitations of the research have been revealed for cautions, and recommendations for future research have also been suggested to strengthen the research findings.

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APPENDIX A – LIST OF PUBLICATIONS

Refereed Conference Publications

HAYAT, E. & AMARATUNGA, D. 2014. The Impact of the Local Political and Socio-Economic Condition to the Capacity of the Local Governments in the Maintenance of Post-Disaster Road Infrastructure Reconstruction Assets. 4th International Conference on Building Resilience. Salford, UK.

HAYAT, E. & AMARATUNGA, D. 2014. The Institutional Factors of Local Government Road Maintenance Capacity – Evaluating the Maintenance of Road Reconstruction Assets in Aceh, Indonesia. 3rd Annual Meeting of the ANDROID Disaster Resilience Network Salford, UK.

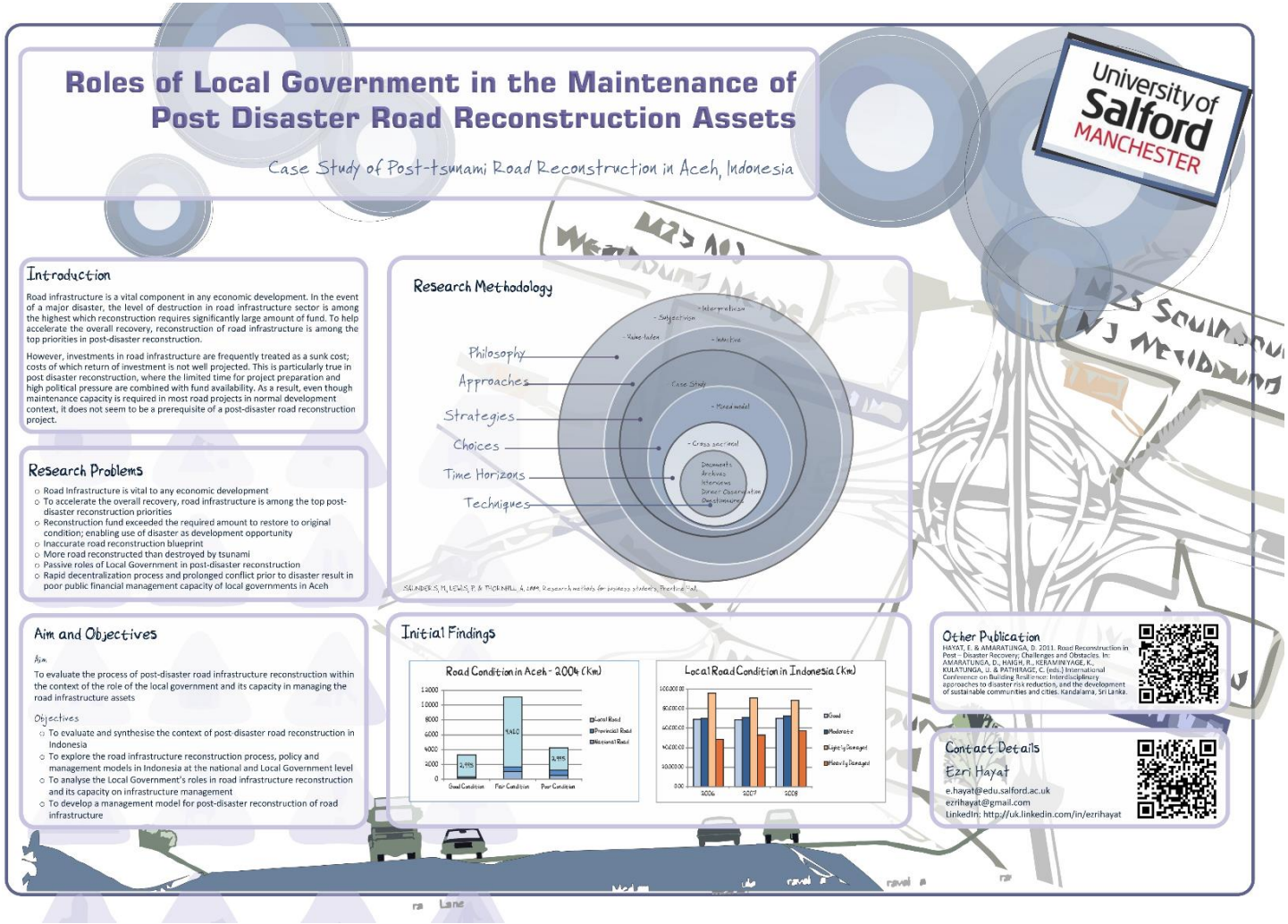
HAYAT, E., AMARATUNGA, D. & HAIGH, R. 2013. Research Approach to Evaluate Post-Disaster Road Reconstruction in Indonesia. *IPGRC.* Salford, UK.

HAYAT, E. & AMARATUNGA, D. 2012. Post-disaster Road Reconstruction in Aceh - Local Governments' Role in Road Maintenance. *The 8th Annual Conference of International Institute for Infrastructure Renewal and Reconstruction (IIIRR).* Kumamoto, Japan.

HAYAT, E. & AMARATUNGA, D. 2012. Roles of Local Governments in the Maintenance of Post-Disaster Road Reconstruction Assets. *SPARC.* Salford.

HAYAT, E. & AMARATUNGA, D. 2011. Road Reconstruction in Post – Disaster Recovery; Challenges and Obstacles. *In:* AMARATUNGA, D., HAIGH, R., KERAMINIYAGE, K., KULATUNGA, U. & PATHIRAGE, C. (eds.) *International Conference on Building Resilience: Interdisciplinary approaches to disaster risk reduction, and the development of sustainable communities and cities.* Kandalama, Sri Lanka.

Poster Presentations



What are the challenges in building Local Governments' road maintenance capacity?

A case study on the post-tsunami road reconstruction in Aceh, Indonesia

Ezri Hayat and Dilanthi Amaratunga
Centre for Disaster Resilience University of Salford

1. Introduction

In major disasters, such as tsunami, road infrastructure sector frequently suffers one of the most damages and losses. In the Boxing Day tsunami in 2004, more than 2700km of roads destroyed, and **more than 3600km of roads** were **repaired and rebuilt**. Since the local governments are held responsible for the maintenance of most of the reconstructed assets, there are **concerns** whether the roads can be maintained, particularly when the **maintenance capacity** of the **local governments** have been renowned to be **limited**. Therefore, capacity building is considered as an important aspect in post-disaster road reconstruction, in order to obtain the maximum value of the investment made in the reconstruction.

2. Objectives

As part of an ongoing PhD research, the objective of this poster has been set to **identify the challenges** in the implementation of the capacity building programs in the road sector. Three districts in Aceh were selected as the case studies; **Aceh Besar, Aceh Jaya, and Aceh Barat Daya**

3. Methodology

The primary data was collected using semi-structured interviews with **28 respondents** from the national, provincial and district level; representing the governments, donor agencies, and private sectors. The respondents were selected using a mix of purposive and snowballing sampling methods. The interviews were conducted in **face-to-face** approach The data was analysed using **Content Analysis technique**, with the aid of **nVivo version 10.**

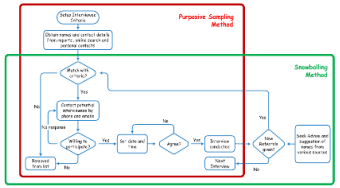


Figure 1 - Sampling method

4. Results

The analysis of data shows that the challenges are rooted to **four main problems;** low **political** interest, poor **budget** allocation for capacity building programs, poorly designed capacity building **programs**, and the **personnel** issues. Some of these challenges appear to be inter-related, which solutions therefore require comprehensive approach. More detailed issues identified in each categories are illustrated below.

Each of these categories contain a number of challenges which describes the specific problem identified from the interviews. The low political interests mainly resulted in the lack of awareness towards the importance and needs for capacity building programs. Consequently, the budget allocation is also limited. The "Poor capacity building programs" refers to the quality and and sufficiency of capacity building activities in the districts. The findings suggest that whilst capacity building programs are limited, they are also ineffectively and inefficiently delivered. On the other hand, personnel issues were also found to be a barrier in the capacity building efforts. The issue of lack of skilled personnel was worsened by the fact that personnel are assigned to inappropriate posts.

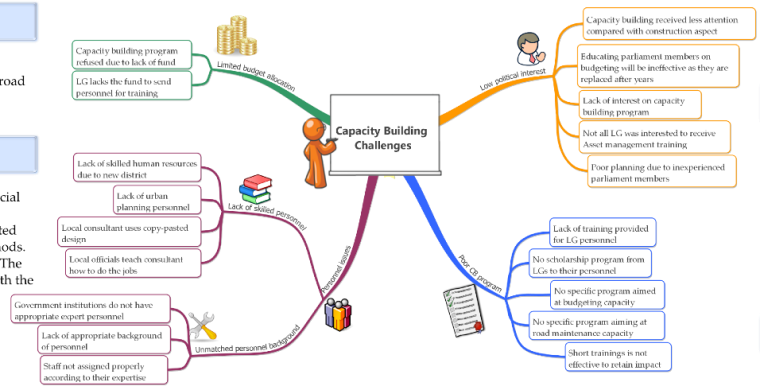


Figure 2 - Capacity Building Challenges

Table 1 - District Road Condition in Indonesia

Condition	2006		2007		2008	
	km	%	km	%	km	%
Good	69,050	24.4%	68,727	24.3%	69,948	24.3%
Moderate	69,921	24.6%	71,106	25.1%	72,330	25.1%
Lightly Damaged	96,019	33.9%	90,799	32.0%	88,462	30.7%
Heavily Damaged	48,620	17.1%	52,687	18.6%	57,443	19.9%
Total	283,611	100%	283,321	100%	288,185	100%

5. Conclusion

Four major categories of challenges and obstacles have been identified in the implementation of capacity building programs to improve the Local Governments' capacity in road maintenance within the context of the post-disaster reconstruction.

By identifying the capacity building challenges, it is expected that **future post-disaster road reconstruction** may put into account these issues, and eventually **help ensure** that the **optimum value** is achieved from the **investment** made in the reconstruction of road infrastructure.

6. References

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LEVIK, K. How to sell the message "Road maintenance is necessary" to decision makers. First Road Transportation Technology Transfer Conference in Africa, 2001.

Contact details and other publications

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APPENDIX B – HIGH LEVEL SEMI-STRUCTURED INTERVIEW GUIDELINES

Research Participant Consent Form

The Roles of Local Government in the Maintenance of Post-disaster Road Reconstruction Asset

(circle as appropriate)

➢ I confirm that I have read and understood the information sheet for the above study and what my contribution will be.	**Yes**	**No**
➢ I have been given the opportunity to ask questions (face-to-face, via telephone and e-mail)	**Yes**	**No**
➢ I agree to take part in the interview	**Yes**	**No**
➢ I agree to the interview being tape recorded	**Yes**	**No**
➢ I understand that my participation is voluntary and that I can withdraw from the research at any time without giving any reason	**Yes**	**No**

Name of participant :

Signature :

Date :

The interview (and/or any other materials related to the interview) and all replies to the questionnaire will be treated with **strict confidentiality** and will be made available only to members of the supervisory staff. Excerpts from the interview and individual results may be part of the final thesis or academic papers, but **under no circumstances your name or any identifying characteristics be disclosed in such publications**. The data collected will only be used for the research purposes, and will not be disclosed to any other person, or be used for other purposes.

Name of researcher :

Signature :

Date :

Interview Guidelines

The Roles of Local Government in the Maintenance of Post Disaster Road Reconstruction Asset

The focus of this study is on evaluating the process of post-disaster road infrastructure reconstruction within the context of the role of the local government and its capacity in maintaining the road infrastructure. Accordingly, the scope of the study is limited to stakeholders of the road reconstruction which include national government, donor agencies, provincial government, local government and private sectors represented by consultants and contractors companies as well as chamber of commerce. Information will be gathered from the key personnel involved in the reconstruction of road infrastructure in Aceh, including policy makers, project leaders, field officers, and company managers.

The interview protocol consists of two sections:

Section A: Information about the interviewee

Section B: Interview outlines.

The interview questions are based on your current and past experience and knowledge on the road infrastructure reconstruction with particular reference to the tsunami reconstruction in Aceh.

Thank you in advance for participating in this study. If you have any queries, please do not hesitate to contact me.

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Supervisor:
Professor Dilanthi Amaratunga
The University of Salford
+44(0) 161 295 4471

Section A: Information about the interviewee

Interviewee Type

National Government	NG
Donor Agencies	DO
Provincial Government	PG
Local Government	LG
Consultant	CO
Contractors	CT
Others	OT

Remarks: .....

Interviewee Code	

Location:	
Date:	**Time:**
Name:	
Job Designation:	
Organisation:	
Contact Details:	
Telephone:	**Fax:**
Email Address:	

Section B: Interview outlines

Interview Questions

Table 1

Interview Questions	✓
I. Interviewee background	
1) Could you tell me what was your role in the reconstruction of Aceh?	
2) Could you tell me your work experience prior to the reconstruction of Aceh?	
3) Were you also involved in the road construction project?	
II. Planning and Design	
4) Who was in charge of the planning and design of road reconstruction projects in Aceh?	
5) Who were involved in the planning and design of road reconstruction projects in Aceh?	
6) Compared to the planning and design in the normal development project, are there any differences in the post-disaster planning and design process?	
7) What were the parameters used for making project priorities?	
8) Were the local governments involved in the planning and design process?	
9) Particularly in post-disaster reconstruction, political and social condition was often considered an important influence in making decisions, how was it in Aceh post-tsunami road reconstruction?	
10) For the reconstruction of district road, has the source of finance been decided/obtained at the planning stages?	
11) Was the maintenance financial requirement included in the project budget?	

12) What are the challenges and obstacles experienced in this process?	
13) How much time was available for the planning process?	
III. Procurement Process	
14) Who was in charge for the procurement process	
15) Which procurement standards were used	
16) Compared to the procurement in the normal development project, are there any differences in the procurement process?	
17) Were the local governments involved in the process?	
18) What are the challenges and obstacles experienced in the procurement process	
IV. Construction Process	
19) Who was in charge for the construction process?	
20) Were the local governments involved in the construction process?	
21) What are the challenges and obstacles experienced in this process	
22) As the time for the planning was limited, were there any consequences due to this in the project implementation phase?	
23) Was there any difference between the planning (blueprint) and the actual construction?	
V. Asset Transfer Process	
24) After completion, were the road asset transferred to other party?	
25) What were the responsibilities expected from the asset recipient after the transfer process?	

26) What are the challenges and obstacles experienced in this process	
VI. Asset Sustainability	
27) Maintenance	
• *Was the project also including provision of maintenance fund or maintenance project?*	
• *Were capacity, readiness and acceptance of local governments for maintenance made as part of project feasibilities?*	
• *With regards to post-disaster context, how possible is it for the planning and design process put into account the maintainability aspects of the road infrastructure?*	
• *Once the project finished and transferred to local government, is there any follow up program from the donor/ national government's side. (e.g., assessment of road condition, maintenance assistance project)*	
28) Capacity building	
• *Was there any capacity building programs aimed at road maintenance?*	
29) Looking at the post-disaster circumstances, do you think the local government has been properly involved in the road reconstruction process?	
VII. Closing questions	
30) Do you think the road reconstruction in Aceh was successful?	
31) Is there any particular experience or information that you want to highlight regarding your experience in road reconstruction in Aceh?	
32) If there was a chance to improve or change the experience in Aceh, what would you change/ improve/ do differently?	

Thank you very much for your valuable time spent on this interview

APPENDIX C – CASE STUDY SEMI-STRUCTURED INTERVIEW GUIDELINES

Research Participant Consent Form

The Roles of Local Government in the Maintenance of Post-disaster Road Reconstruction Asset

(circle as appropriate)

➢ I confirm that I have read and understood the information sheet for the above study and what my contribution will be.	Yes	No
➢ I have been given the opportunity to ask questions (face-to-face, via telephone and e-mail)	Yes	No
➢ I agree to take part in the interview	Yes	No
➢ I agree to the interview being tape recorded	Yes	No
➢ I understand that my participation is voluntary and that I can withdraw from the research at any time without giving any reason	Yes	No

Name of participant :

Signature :

Date :

The interview (and/or any other materials related to the interview) and all replies to the questionnaire will be treated with **strict confidentiality** and will be made available only to members of the supervisory staff. Excerpts from the interview and individual results may be part of the final thesis or academic papers, but **under no circumstances your name or any identifying characteristics be disclosed in such publications**. The data collected will only be used for the research purposes, and will not be disclosed to any other person, or be used for other purposes.

Name of researcher :

Signature :

Date :

Interview Guidelines

The Roles of Local Government in the Maintenance of Post Disaster Road Reconstruction Asset

The focus of this study is on evaluating the process of post-disaster road infrastructure reconstruction within the context of the role of the local government and its capacity in maintaining the road infrastructure. Accordingly, the scope of the study is limited to stakeholders of the road reconstruction which include national government, donor agencies, provincial government, local government and private sectors represented by consultants and contractors companies as well as chamber of commerce. Information will be gathered from the key personnel involved in the reconstruction of road infrastructure in Aceh, including policy makers, project leaders, field officers, and company managers.

The interview protocol consists of two sections:

Section A: Information about the interviewee

Section B: Interview outlines.

The interview questions are based on your current and past experience and knowledge on the road infrastructure reconstruction with particular reference to the tsunami reconstruction in Aceh.

Thank you in advance for participating in this study. If you have any queries, please do not hesitate to contact me.

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Supervisor:
Professor Dilanthi Amaratunga
The University of Salford
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Section A: Information about the interviewee

<table>
<tr><td colspan="2">Interviewee Type

<table><tr><td>National Government</td><td>NG</td></tr><tr><td>Donor Agencies</td><td>DO</td></tr><tr><td>Provincial Government</td><td>PG</td></tr><tr><td>Local Government</td><td>LG</td></tr><tr><td>Consultant</td><td>CO</td></tr><tr><td>Contractors</td><td>CT</td></tr><tr><td>Others</td><td>OT</td></tr></table>
Remarks: .....</td><td><table><tr><td>Interviewee Code</td><td></td></tr></table></td></tr>
<tr><td colspan="2">Location:</td></tr>
<tr><td>Date:</td><td>Time:</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Name:</td><td></td></tr>
<tr><td colspan="2">Job Designation:</td></tr>
<tr><td colspan="2">Organisation:</td></tr>
<tr><td>Contact Details:</td><td></td></tr>
<tr><td>Telephone:</td><td>Fax:</td></tr>
<tr><td>Email Address:</td><td></td></tr>
</table>

Section B: Interview outlines

Interview Questions	✓
I. Planning and Design	
1) Who were involved in the planning and design of road infrastructure development	
2) What were the parameters used for making project priorities?	
3) Particularly in post-disaster reconstruction, political and social condition was often considered an important influence in making decisions, how was it in Aceh?	
4) Was the maintenance financial requirement included in the project budget?	
5) What are the challenges and obstacles experienced in this process?	
II. Procurement Process	
6) Who was in charge for the procurement process	
7) What are the challenges and obstacles experienced in the procurement process	
III. Construction Process	
8) Who was in charge for the construction process?	
9) What are the challenges and obstacles experienced in this process	
IV. Asset Transfer Process	
10) What were the responsibilities expected from the asset recipient after the transfer process?	
11) What are the challenges and obstacles experienced in this process	

V. Road maintenance	
12) Once the reconstruction assets were finished and transferred to local government, was there any follow-up program from the donor/ national government's side. (e.g., assessment of road condition, maintenance assistance project)	
13) How have the political and social condition affected the decision making process?	
14) What are the main challenges in maintaining the road infrastructure	
VI. Capacity building	
15) Was there any capacity building programs aimed at road maintenance?	
16) Looking at the post-disaster circumstances, do you think the local government has been properly involved in the road reconstruction process?	
VII. Closing questions	
17) Do you think the road reconstruction in Aceh was successful?	
18) What are the indicators of success of the road reconstruction projects in post-disaster setting?	
19) Is there any particular experience or information that you want to highlight regarding your experience in road reconstruction in Aceh?	
20) If there was a chance to improve or change the experience in Aceh, what would you change/ improve/ do differently?	

Thank you very much for your valuable time spent on this interview

APPENDIX D – EXPERT VALIDATION INTERVIEW GUIDELINE

Expert interview protocol – English version

Research Participant Consent Form

Project Title : Evaluating the Local Governments Capacity in Road Maintenance Within The context of Post-disaster Reconstruction

(Delete as appropriate)

➢ I confirm that I have read and understood the information sheet for the above study and what my contribution will be.	Yes	No
➢ I have been given the opportunity to ask questions (face to face, via telephone and e-mail)	Yes	No
➢ I agree to take part in the interview	Yes	No
➢ I agree to the interview being tape recorded	Yes	No
➢ I understand that my participation is voluntary and that I can withdraw from the research at any time without giving any reason	Yes	No

Name of participant :

How do you best describe your occupation? Tick (√) one or more as appropriate.

Academics	Consultants	Contractors	Governments Employee	Donor Agency	Other (please specify)
.....	.....	.....	.....	.....	.....

Years of Experience. Tick (√) as appropriate.

1-5 years	6-10 years	11-15 years	16-20 years	25 years or more
.....	.....	.....	.....	.....

Signature :

Date :

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The interview (and/or any other materials related to the interview) and all replies to the questionnaire will be treated with strict confidentiality and will be made available only to members of the supervisory staff. Excerpts from the interview and individual results may be part of the final thesis or academic papers, but under no circumstances your name or any identifying characteristics be disclosed in such publications. The data collected will only be used for the research purposes, and will not be disclosed to any other person, or be used for other purposes.

Name of researcher :

Signature :

Date :

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Research findings

The research findings as listed further down below are findings obtained from the analysis of data collected from semi-structured interviews with 28 participants representing the government, donor agency, and the private sector at the national, provincial, and the local level. The data was analysed qualitatively using content analysis technique, with the aid of nVivo version 10.

The main objectives of conducting the expert interviews is to validate the findings of the research. This was conducted as part of triangulation of research findings. The findings of the research are accordingly grouped into four main categories, which will be elaborated in more detailed points. The four categories are:

- General response to road maintenance
- Main factors affecting local governments road maintenance performance
- Post-disaster reconstruction process
- Post-conflict areas

Please provide your views and experiences on the research findings as they are identified from the data analysis below.

1. **Local Governments' general responses to road maintenance**
   - Road maintenance is not a culture in the road authorities at the local level
   - Roads are generally neglected soon after they are built
   - Routine and periodic maintenance are not regularly performed - Roads are repaired when it is broken
   - Road rehabilitation and surface upgrade are considered as the required repair interventions
2. **Main factors affecting local governments road maintenance performance**

Local political condition

- Politicians highly influence the determination of development priority
- Due to the budgeting authority, local governments tend to accommodate the parliament interventions on development planning and programming
- There is high preference on road capital projects as they are more politically attractive
- The fairness and equality issues add pressure to distribute and disperse project location, regardless the actual priority and necessity
- The needs to equally provide access and improve the economic condition overshadow the needs to prioritise road maintenance over road networks expansion and upgrade

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- **Conflict of authorities**
  - The conflict of authorities between public works and department of transportation with regards to road management makes it difficult to hold both agencies accountable and responsible for the road deterioration problems.

- **Financial capacity**

  Four financial issue
  - Fund is not allocated in sufficient amount – the money is not enough to maintain the road networks
  - The allocated fund is not spent – the road authorities cannot spend the budget allocated to them
  - Fund is not spent effectively – money is used for inappropriate repair work interventions.
  - Fund is not spent efficiently – large proportion is used for routine expenditure; i.e. Salary, office administration, travels, etc.

  Budgeting approach
  - As the fund is sourced from the general budgetary mechanism, road maintenance loses its priority over other needs

- **Human resources**

  Accountability issue
  - Due to lack of reliable road information system, road authorities are unable to produce reliable and accountable road maintenance planning
  - Unreliable road maintenance planning resulted in road maintenance needs being neglected

  Capacity building challenges
  - Poor political interest - Capacity building programs lack the support from the political leaders, who are more interested on activities that yield more immediate and visible benefits
  - Budget allocation for capacity building program is very limited
  - The capacity of the Local government personnel is poor; affected by poorly skilled personnel and inappropriate educational background
  - Poor capacity building programs; ineffective programs

3. **Post-disaster reconstruction process**

- **Asset transfer issue**
  - Asset transfer process resulted in reconstruction assets neglected from maintenance
  - Asset transfer problems and delays are used to justify the absence of road maintenance.
  - Reconstructed road sections need to be returned back to the local governments immediately after their completion.

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- **Consideration of road maintenance needs**
  - Future road maintenance needs was not well accounted for in the post-disaster reconstruction, as the focus was on the reconstruction speed and to meet the needs.
  - The MoU for maintenance between local government and the BRR was not effective to ensure that roads are maintained
  - The selection of high standard pavement (hotmix asphalt) resulted in new trends in the local road authorities to use and upgrade their road networks to hotmix asphalt, neglecting the economic benefits of different surface type.

- **Local government involvement in post-disaster reconstruction**
  - Local governments are mainly involved in three ways
    - Inputs gathering
    - Recruitment and assignment of the local governments personnel in the BRR
    - Coordination and distribution of task and the establishment of Joint Secretariat
  - Post-disaster condition was a constrain to effective and efficient involvement of the local governments

4. Security and safety issue in the post-conflict area

Main security and safety issue:

- Oppressive behaviour from the community and individuals nearby the road project; lead to project disruption
- Forceful request of 'security fee'; lead to expensive project cost
- Safety threats resulting to relaxed construction supervision; lead to poor construction quality

Thank you very much

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